



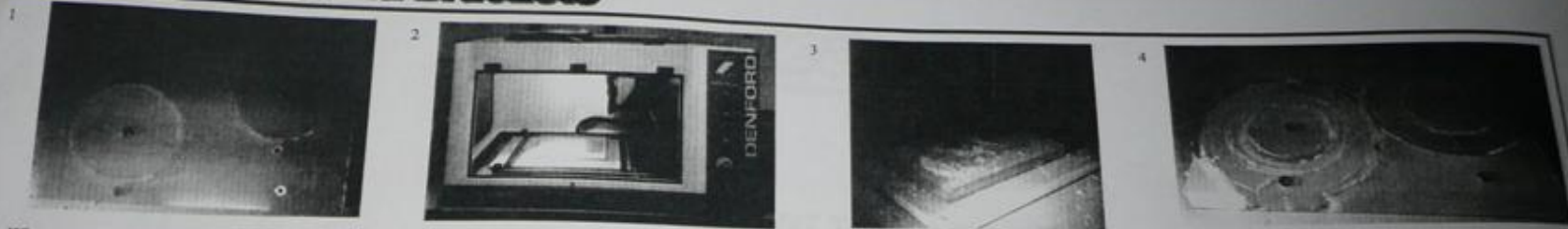






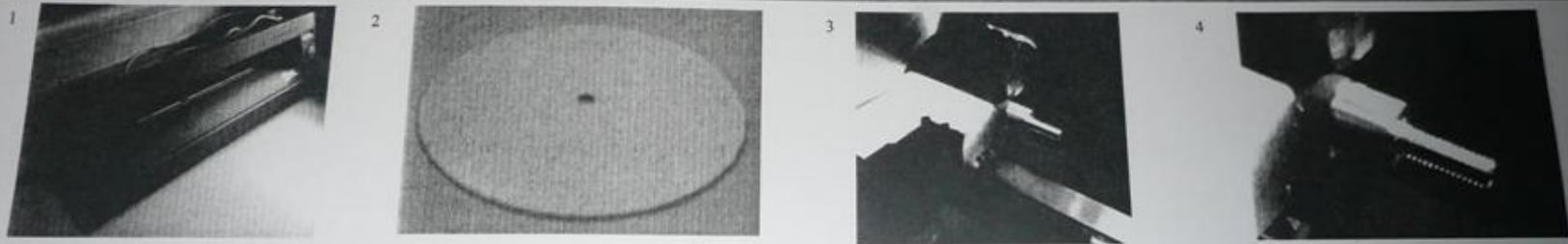
Mo
low

Manufacture Of End Brackets



When manufacturing the end brackets I was advised to treat it as two separate drawings to cut. The reason for this is because the acrylic needed mechanically held in place because of the amount of force being applied to it by the cutter. To do this I saved two drawings. The first being the 5mm circular cut in the middle to house the end of the plastic tubing with the four holed for the socket caps. The second drawing was to cut away the inner circle and also to cut away the excess material from around the outside. As shown in the picture one above, all the separate parts have been screwed to the wood meaning there is no possibility of small parts being caught by the cutter and flying around the machine possibly damaging the rest of the brackets. The first cut allowed this as I was able to use the socket cap holes for the screws. This means no extra holes were needed to be drilled in the work.

Manufacture Of Non-Return Valve



When making the non return valve I tried to cut the hypalon with a scalpel, cutting around a circular disk slightly smaller than the valve. This did not work as the cut was not very neat. I then did a solid works drawing of the valve and used the Vinyl Cutter to cut the circle. This is shown in picture one above.

To secure the hypalon to the valve itself I made a small brass M4 screw on the lathe and cut a small slit for a flat head screw driver. This is shown in picture three above. Unfortunately I was unable to get images of the cross being made.

Manufacturing Of hull And Hypalon Tubing

When manufacturing the hull of my project I used the CNC machine. This was because I needed the hole cut out perfectly from the middle for a perfect fit. I then used the linisher to round the edges to improve aesthetics. I then primed and painted it, trying to get as close a match to the actual hull colour of my boat.

I cut the hypalon tubing as a rectangle and marked a 10mm overlap for gluing. The glue I used was specifically designed for hypalon and is waterproof. As I have stated on previous pages, the jubilee clip is there so as the tubing can be removed if required.

Testing and Evaluation

Page 1

Changes during Manufacture

During manufacture I changed very few things. These consisted of, the non return flap, a jubilee clip and the popper on the hypalon tubing.

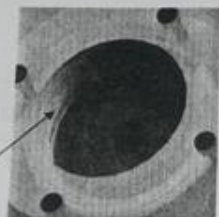
Non-Return Valve

The first thing I changed about my product was the distance the hypalon flap could move. I limited this because when I was testing the non return flap before assembly I discovered that because it is a stiff material, it did not close properly meaning water could leak into the boat from the outside when stationary. To avoid this I made the end brackets overlap the hole in the boat hull. This means the flap can only go so far before it stops and returns to being fully closed.



Overlap

From this image you can see the amount of room the flap has to move. This gap still allows water to escape but now also allows the hypalon to close fully.



Jubilee Clip

The second modification I have made to my product during manufacture is using a jubilee clip to hold the tubing onto the outside bracket. I decided to do this so as the product could be easily disassembled and maintained. This option is instead of using an adhesive to attach the tubing as this would be permanent.

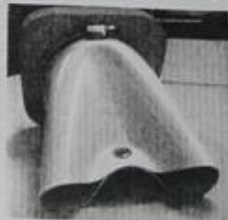


These pictures show a stainless steel jubilee clip which securely attaches the tubing to the outside bracket.



Popper on Hypalon Tubing

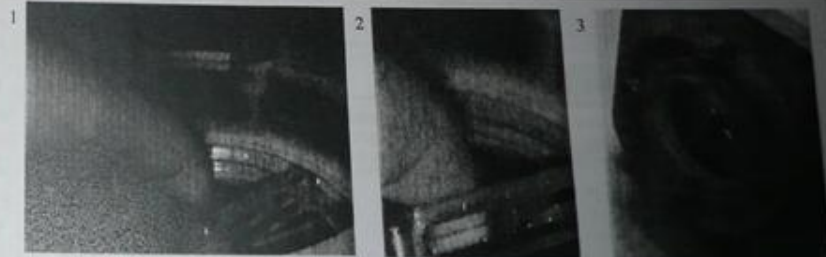
The popper was added for several reasons. I thought that by doing this it would improve the aesthetics of the product when closed. When the boat is out of the water the popper could be opened meaning if there is heavy rain the water would drain quicker.



These pictures show the popper open and also closed. The closed popper would be used when the boat is in the water and the open popper would be used when out of the water.



Testing



When testing my project I did not want to use water as I did not want the paint to bubble or the MDF to be effected. My next idea was to use an air gun but unfortunately did not have the facilities for this. To test the project I simply pressed the valve with my finger to show the gap that will be formed when the force of the water presses against it. It does not take much force to work. This gap is shown in picture one and two above. To prove that there was no gap when force was applied to the other side, I got a friend to take a picture while I applied a small force. This is shown in picture three.

If this product was being manufactured in factories I would change some materials. The hull would obviously be on the boat already so this would be made from fibreglass. The socket caps I have used would be made of stainless steel or treated with something (galvanised), this would be the same for the brass screw holding the hypalon flap in position. The acrylic brackets would be perfect although they would be quite expensive. A more inexpensive way would most likely need to be found.

I am very pleased with the way my project has turned out. It does the job it was designed to do very well, and I feel that it fits the specification stated.

Testing and Evaluation

Changes During Manufacture

During manufacture I changed very few things. These consisted of, the non return flap, a jubilee clip and the popper on the hypalon tubing.

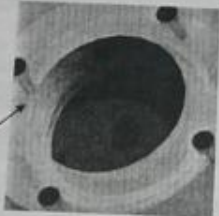
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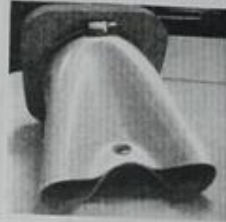


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Popper on Hypalon Tubing

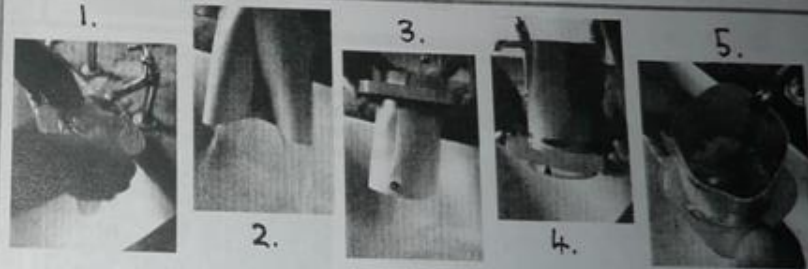
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These pictures show the popper open and also closed. The closed popper would be used when the boat is in the water and the open popper would be used when out of the water.



Testing



When testing my product, I wanted to use an air gun as I was worried that the paint may bubble or the MDF may become damaged if I used water. Unfortunately the air gun was not available so I went back to using water. I put my product under the tap, and shown above are the results. Pictures one and two and three show the water able to escape from the boat, both with popper open and closed. Picture four shows that no water is able to enter the boat through the system and finally picture five shows the build up of water inside the tubing as it cannot escape.

If this product was being manufactured in factories I would change some materials. The hull would obviously be on the boat already so this would be made from fibreglass. The socket caps I have used would ideally be stainless steel or treated with something (galvanised), this would be the same for the brass screw holding the hypalon flap in position. The acrylic brackets would be more suitable if made from nylon. This would be less expensive to produce and the nylon would be injection moulded into the bracket shapes. I am very pleased with the way my project has turned out. It does the job it was designed to do very well, and I feel that it fits the specification stated.

Evaluation Against Specification

Page



These two pictures show the tubing popped closed. This allows less water to back flow into the non return valve meaning it protects the valve and gives it less work. In my opinion, it looks more attractive when it is in this position.



1. This system must be automatic to make it as easy to use as possible. The original system was manual and was a hassle to operate.
2. This system must be able to be used easily and look easy to use both in and out of the water. Although the system will be automatic, the aesthetics are still important as you want the product to look as well as you can get it.
3. This system must be easily accessible and maintained. As the product will be held in place with four M6 socket caps it will be able to easily be taken apart allowing the different parts to be cleaned or replaced.
4. This system must be good aesthetically as it will be seen from inside the boat. This is why I was thinking of a round idea. I feel that blunt edges look better aesthetically than straight edges.
5. This system should have tubing to allow water to escape. A shorter length or the original tubing could be used as it will be attached to the bracket on the outside of the boat and will not need to fold away.
6. This system must have a non return valve to stop the water entering the boat through the tubing. This will have to be extremely effective as the boat could fill with water while sitting stationary if it is not.
7. The tubing must be shorter than the original as there is no need for it to be folded away as I have stated previously. E.g., 150mm. this tubing will help to cover the bailing system meaning there will be less water entering the system for the non return valve to block.
8. The new tube must have a diameter of no more than 100mm to avoid it being an unnecessary size. The original elephant trunk is 100mm and this is the reason I liked it. It was near impossible to become blocked. I also feel 100mm is slightly large and an 80mm tube would be the perfect size to avoid blockages but not be too large.
9. This system must be able to bail water from a boat efficiently and effectively. People will be more likely to buy a system that will bail the water quickly and without them having to do anything. This system will not have electrics either which means there is less to go wrong.
10. This system must cost no more than £20 to stay at a competitive price. Most automatic products are around this price or more so at a maximum I would like my product to cost £20.

1. My Product is automatic and so is very easy to use.
2. As the system is inside the hull and all that can be seen are the two brackets, this product does look easy to use. It also looks very neat.
3. As the product is held together by four M6 socket caps it can be easily taken apart and maintained.
4. As I have chosen to use clear acrylic and made it a round shape, the product looks very neat and attractive.
5. My product does have a shorter length of tubing than the original "elephant trunk" idea on the outside.
6. My product does have a non return valve which stops water entering the boat the outside while moving and stationary.
7. The tubing on my product is very much shorter than the original and now has a popper at the end so as the user can chose whether or not to have the tubing fully open or not. This means that it can protect the valve as well as allowing less water to reach the valve from the outside.
8. The new system is less than 100mm in diameter and so agrees with the specification.
9. My product does bail water efficiently and effectively which again agrees with my specification.
10. For my product I would charge between £15 and £20 which does stay at a competitive price.



These two pictures show the tubing open. This would allow more water to leave the boat which is why I have not made it permanently closed like in the previous two pictures. This does not look as neat as being closed. As I have said previously, this allows more water to force itself against the valve from the outside and so could damage it.



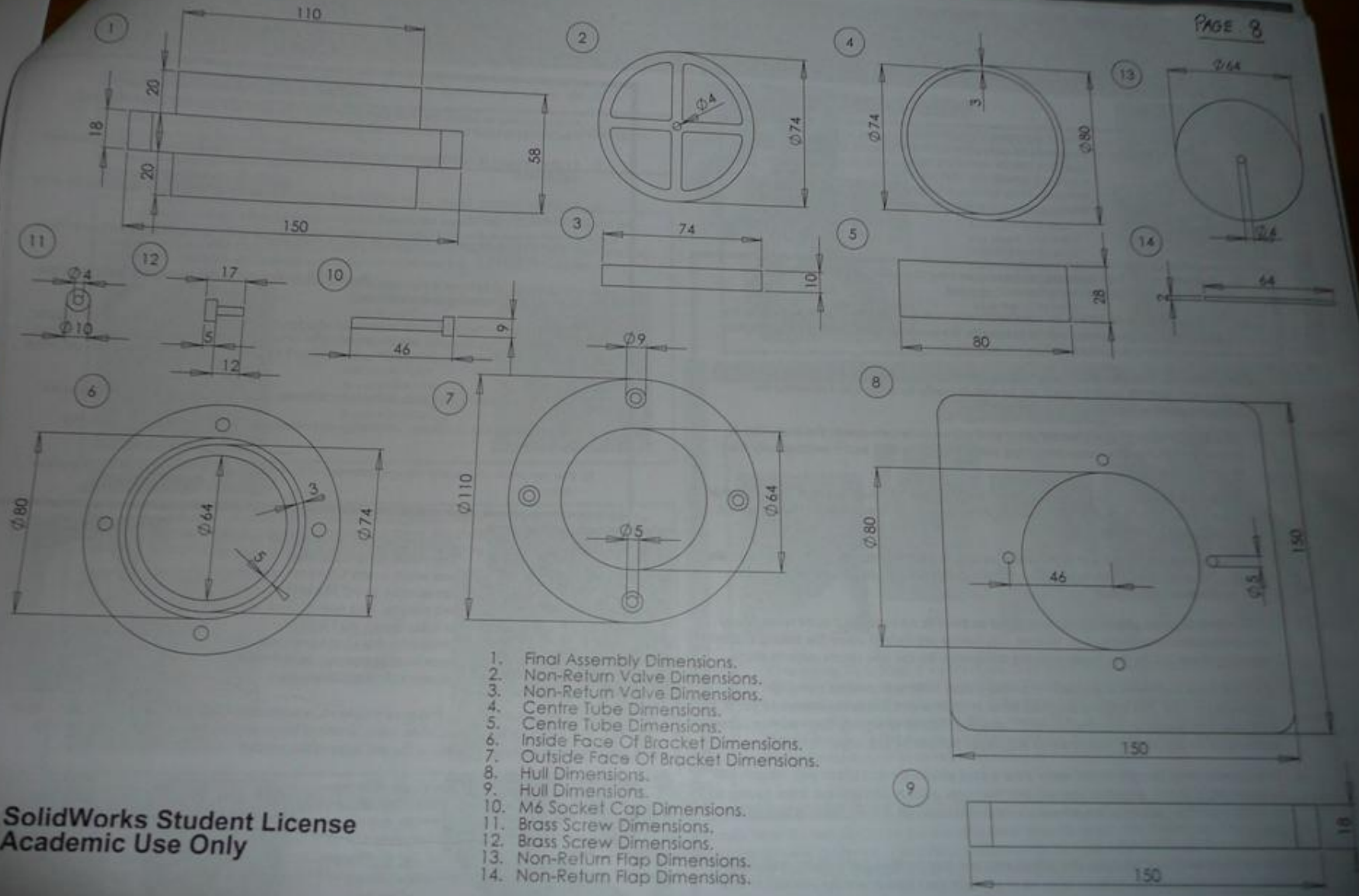
One of the main reasons I decided to put a popper on, was because I thought it would be a good idea to have it open when the boat is out of the water in case of heavy rain but closed when in the water to protect the valve and also to improve the aesthetics of the product.



Left- This is a picture of the original system.

Right- These are pictures of my new product.





1. Final Assembly Dimensions.
2. Non-Return Valve Dimensions.
3. Non-Return Valve Dimensions.
4. Centre Tube Dimensions.
5. Centre Tube Dimensions.
6. Inside Face Of Bracket Dimensions.
7. Outside Face Of Bracket Dimensions.
8. Hull Dimensions.
9. Hull Dimensions.
10. M6 Socket Cap Dimensions.
11. Brass Screw Dimensions.
12. Brass Screw Dimensions.
13. Non-Return Flap Dimensions.
14. Non-Return Flap Dimensions.

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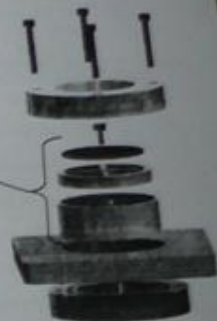
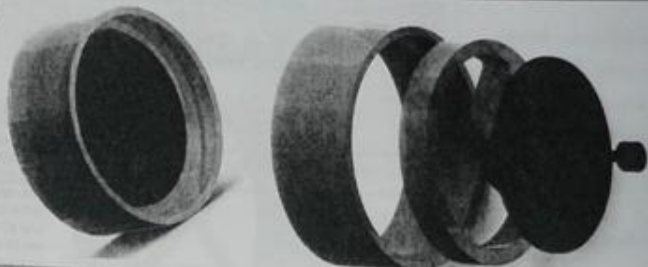
Parts Idea Development

When I found that I would no longer achieve my product the way I first imagined it I thought of a new, more feasible way. I decided to use 80mm hollow tube and make a thicker non return valve to put inside it. This would mean I would not need a protective door as the new valve is 10mm thick instead of 5mm and would be more robust. To secure the tube to the hull I had to design to brackets, one for each end. The two brackets are the same apart from the outer holes for the socket caps which will connect the two brackets together. On the bracket inside the boat the holes go the full way through and have been counter bored to make the M6 socket caps sit flush. The bracket on the outside of the boat has holes bored only half way through and have been threaded for the socket caps to tighten into.

Valve Development

I also decided to change the door idea to a flap made from hypalon as I feel this would be more effective. To secure the flap in place I will turn a length of brass rod on the lathe and thread it. The hole in the centre of the valve will be tapped to locate the brass screw.

As this idea uses hollow tubing instead of solid I had to make the valve in two separate parts that would fit together. I would plan on making the valve itself by rapid prototyping it.



Bracket Development

In this idea I have decided to make to brackets in the same way, with the only differences being that one bracket will have tapped holes to allow the socket caps to catch and the other will not be tapped but have clearance holes to allow the head of the socket caps to sit flush with the surface.



These brackets have slots cut in them to allow the tubing to fit neatly inside.

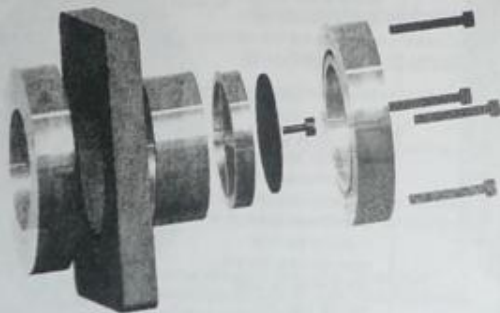


I have chosen M6 socket caps to pull the two brackets together.



The above image is the final assembly without the hull to show how the brackets fit together with the valve.

The image below shows an exploded view of my final product and allows you to see clearly how the product fits together.



Parts being used: To make the two brackets for my project I will save them as STL files from Solid Works and make them on the CNC router; The Valve will be rapid prototyped; the tubing will be cut from a longer piece of tubing and using very fine sandpaper I will sand up the edges before polishing it; to make sure the hole in the hull will be a perfect fit I will use the CNC router to cut a hole slightly smaller than the size I need and sand until the tubing fits perfectly; to make the brass screw I will use 10mm brass rod on the lathe to make an N4 thread. This involves taking the diameter of the shaft to 4mm and I taking 1mm off the head of the bolt to clean it up. I will then thread the shaft. Finally I will cut a slit in the top using a hack saw to allow the bolt to be tightened with a flat head screw driver if needed; I will try and source a length of hypalon from Cyril Johnston Marine to make the flap and also for the length of material on the outside of the boat like the original idea except shorter to avoid creaking.

Plan Of Manufacture

1. Find materials.
2. Cut to correct sizes.
3. Cut center tubing to correct length. 80mm Clear acrylic.
4. CNC two end brackets firstly in MDF to make sure center tubing fits in slots.
5. CNC proper end brackets out of clear acrylic.
6. Laser cut non return valve. Clear acrylic.
7. Cut 80mm hole in MDF hull and adjust to fit center tubing.
8. Fit non return valve in center tubing.
9. Fit center tubing into MDF hull.
10. Fit two end brackets.
11. Tighten together with M6 socket caps.
12. Testing and Evaluation.

FOR PROCESSES SEE BOTTOM OF PAGE 7.

Solid Idea Development

When I decided on my final idea I started thinking of ways to achieve it. I first started to think of a way to stop the water coming into the boat but allow it to exit. I used an idea of a non return valve which I saw in one of the other ballers I researched. Firstly, I designed a non return valve for my product, but obviously I would need something to secure it in place, so I started thinking of ways to achieve this. My product is made from 80mm tubing and trying to source solid 80mm tubing was very difficult, as u had to buy tube that size in 2m lengths, which ended up being too expensive. I was planning to CNC or put the tubing in the lathe to achieve the two shapes below on the left, but again came up with a problem. There would be far too much waste material after machining away the inside of the tubing. Lastly, I wanted to make a door that would be operated by a float. This would protect the 5mm fragile valve. This would simply be machined out of a sheet of acrylic. My final idea is shown on the far right of the page.

Valve



This valve would be made from one solid piece of clear acrylic. I would plan to do this on the CNC router. The reason for this valve being made from one piece is because it would increase the strength.

When I had designed the valve I went on to think of a way to connect it to the hull of

Bracket Development



The idea I came up with was again a solid piece of clear acrylic that I would somehow bore a large hole in.



I would place the valve in the hole and use another small piece of acrylic made in the same way to pull the two halves together.

	Week One 01/02/18	Week Two 06/02/18	Week Three 11/02/18	Week Four 17/02/18
1				
2				
3				
4				
5				
6				
7				
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9				
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12				

Where is the product going to be used?

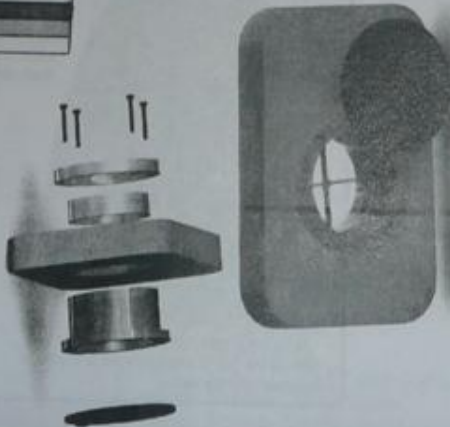
- This product is going to be used in a marine environment so I had to think about what materials I was going to use. I couldn't use metals unless it was stainless steel or treated which would be very expensive, so I choose plastic as it does nit rust and is cheaper.

Maintenance

- This product is put together using socket caps and so can be dismantled and maintained if needed.

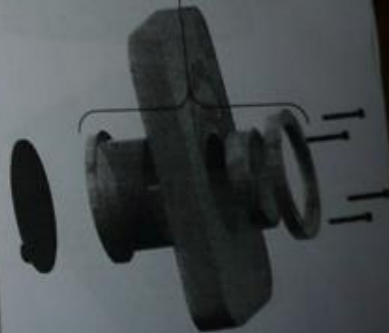
Life and Service

- This product should last for a long time. It cannot rust and it can be easily maintained.

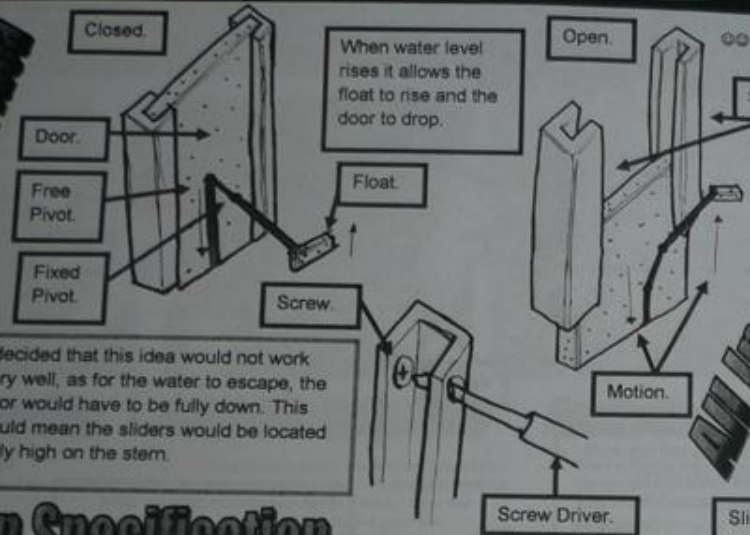


I then moved on to thinking about the idea of a non return valve. I wanted water to escape but not come back in.

The idea I came up with was a door attached by a pivot. This door has a small float attached to it which would allow water inside the boat to swing the door open and escape but water outside could not get past and therefore cannot not



Unlatch And Float Idea



I decided that this idea would not work very well, as for the water to escape, the door would have to be fully down. This would mean the sliders would be located fairly high on the stem.

When water level rises it allows the float to rise and the door to drop.

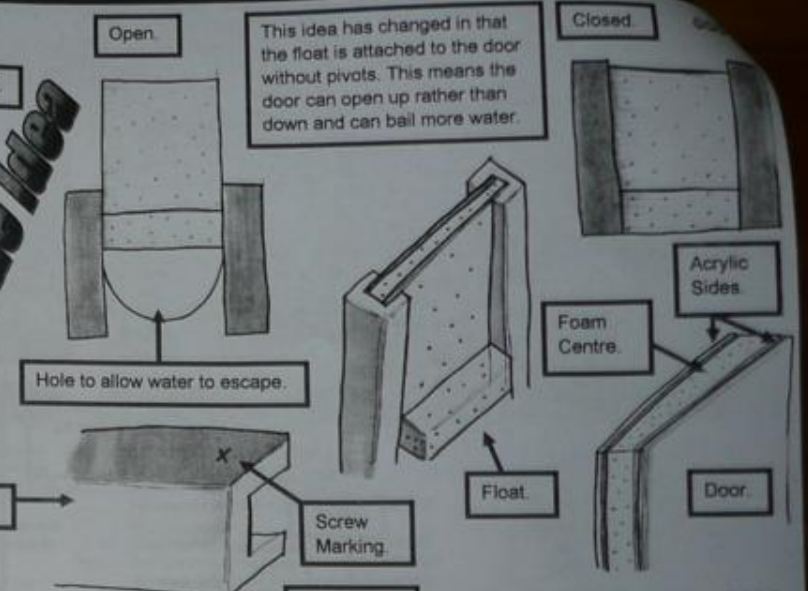
This idea has changed in that the float is attached to the door without pivots. This means the door can open up rather than down and can bail more water.

Design Specification

1. This system must be automatic to make it as easy to use as possible. The original system was manual and was a hassle to operate.
 2. This system must be able to be used easily and look easy to use both in and out of the water. Although the system will be automatic, the aesthetics are still important as you want the product to look as well as you can get it.
 3. This system must be easily accessible and maintained. As the product will be held in place with four M6 socket caps it can easily be taken apart allowing the different parts to be cleaned or replaced.
 4. This system must be good aesthetically as it will be seen from inside the boat. This is why I was thinking of a round idea. I feel that blunt edges look better aesthetically than straight edges.
 5. This system should have tubing to allow water to escape. A shorter length or the original tubing could be used as it will be attached to the bracket on the outside of the boat and will not need to fold away.
 6. This system must have a non return valve to stop the water entering the boat through the tubing. This will have to be extremely effective as the boat could fill with water while sitting stationary if it is not.
 7. The tubing must be shorter than the original as there is no need for it to be folded away as I have stated previously. E.g., 160mm, this tubing will help to cover the balling system meaning there will be less water entering the system for the non return valve to block.
 8. The new tube must have a diameter of no more than 100mm to avoid it being an unnecessary size. The original elephant trunk is 100mm and this is the reason I liked it. It was near impossible to become blocked. I also feel 100mm is slightly large and an 80mm tube would be the perfect size to avoid blockages but not be too large.
- This system must be able to bail water from a boat efficiently and effectively. People will be more likely to buy a system that will bail the water quickly and without them having to do anything. This system will not have electrics either which means there is less to go wrong.

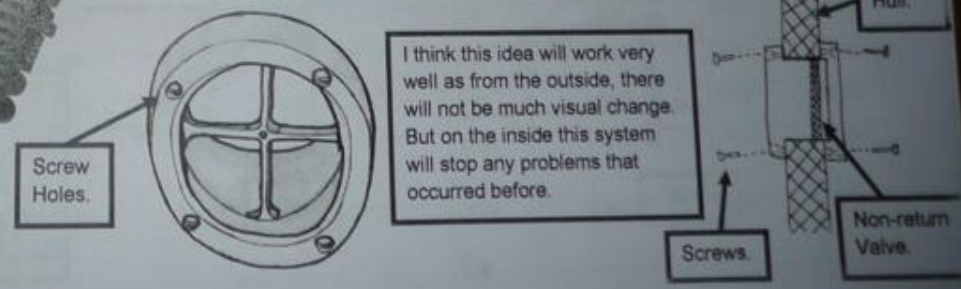
This system must cost no more than £20 to stay at a competitive price. Most automatic products are around this price or more so at a maximum I would like my product to cost £20.

All In One Idea



Connect Balling Idea

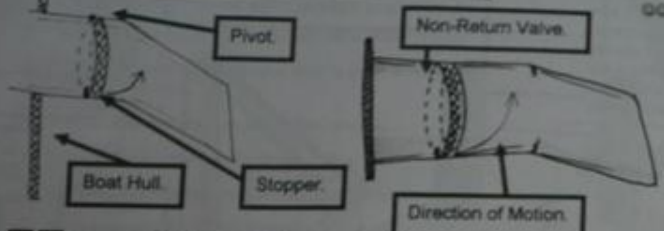
For this next idea, I went back to the non-return valve. I am going to put a valve inside the tube and attach a door with a float on the inside of the boat.



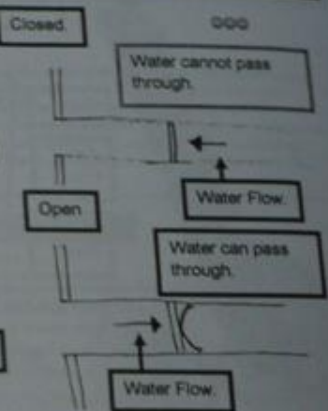
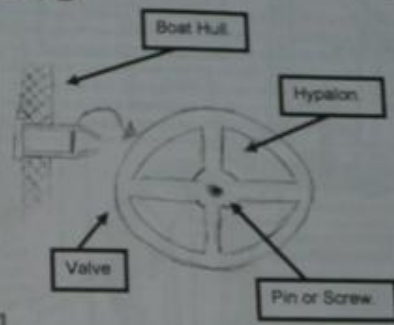
I think this idea will work very well as from the outside, there will not be much visual change. But on the inside this system will stop any problems that occurred before.

Non Return Valve

This system will allow water to escape when the boat is moving and will not allow back fill.



I then changed the idea of the non return flap and valve.



Mechinism

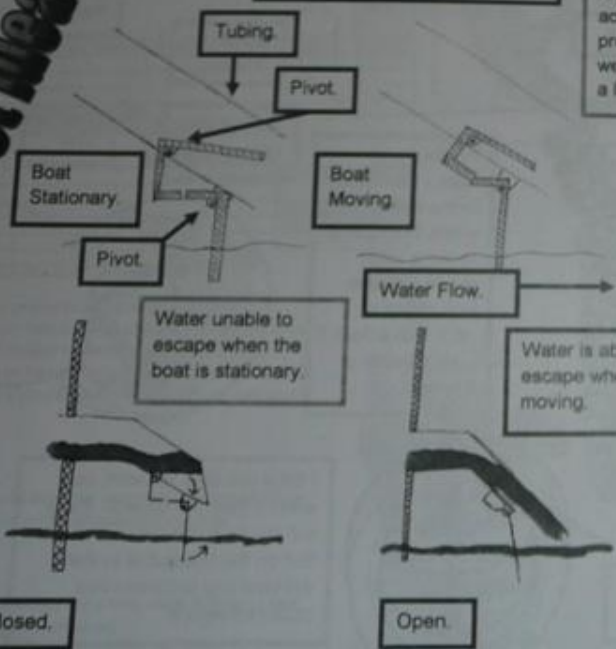
Pivots are spring loaded and so will close when the boat stops.

These ideas will not work for what I set out to achieve. I would like my product to work on land as well and these ideas need a large force to work.

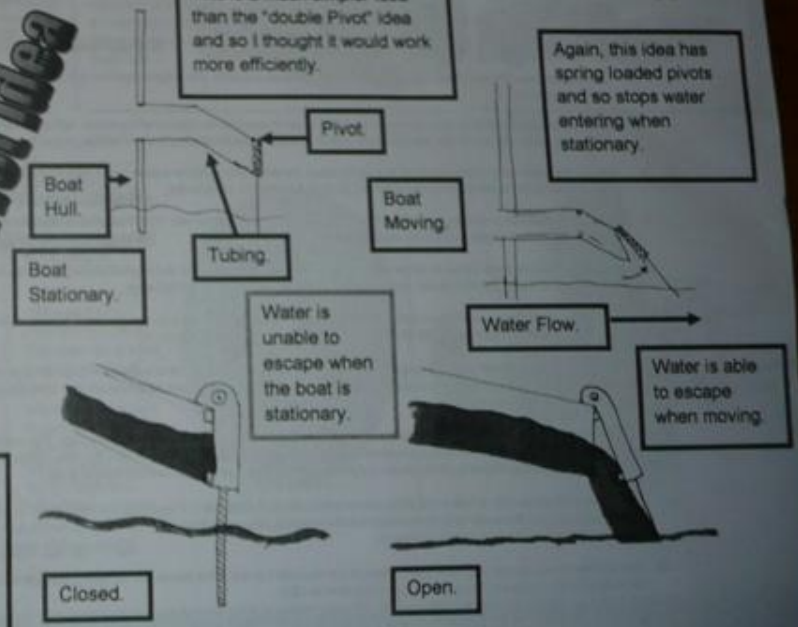
This is a much simpler idea than the "double Pivot" idea and so I thought it would work more efficiently.

Again, this idea has spring loaded pivots and so stops water entering when stationary.

Double Pivot Idea



Single Pivot Idea



- Positive.
- Negative.
- Information.

Closed.

Open.

Closed.

Open.

Investigation and Analysis of Product



Aesthetic Suitability

- The aesthetics are not good.
 - This screw bung is just a small lump of plastic with threads.
 - It's small and can only be seen out of the water so in this case aesthetics are not important.
 - This product looks like it would be easy to use which is a positive point to be considered.
- Although this is not the most exciting product to look at, sometimes aesthetics are less important for different reasons, like will it be seen? In this case the system cannot be seen when in the water and its so small that when out of the water it doesn't attract attention as it is located out of the way and is really only seen when being used.



Aesthetic Suitability

- The aesthetics of this product are important it will be seen at all times. Keeping in mind the technology inside this casing I think the manufactures have done a good job.
- However, if I was changing this I would put a cover over the bilge pump the same colour as the deck of the boat at this would take the attention away from it as the colours are bright and although I think they have done a good job there are still alterations that could be made to make the product slightly more attractive
- This product does look quite confusing to operate as when you purchase one you have connect it to a power supply, which could be very off-putting for someone who has limited electrical knowledge.
- This system can also be damaged if stood on so a cover would need to be fitted.



Aesthetic Suitability

- The aesthetics are not very important as the system is fitted on the outside of the boat and cannot easily be seen when in the water.
- The bailer is made from translucent acrylic which shows all the dirt that gets stuck in the system.
- I would add a filter to either side of the bailing system, hopefully cutting the risk of dirt clogging this system and allowing water to flow out of the boat more freely.
- This system looks very simple to use which is a sign that aesthetics have been thought about.
- This system could be made bigger to avoid the problem of blocking.



Aesthetic Suitability

- The aesthetics are not very good as it is an unattractive piece of plastic sticking into the back of your boat. If this product was being developed I feel this would need to be looked at.
- This product is like the electric bilge pump in that it is inside the boat and will be seen at all times so they could improve this by covering it up or improving it.
- Again aesthetics have clearly been thought about as the product does look very simple to use.



Aesthetic Suitability

- The aesthetics on this product have not really been thought about.
- By looking at it we can see that it is not that easy on the eye.
- Although this product is located on the outside of the boat the aesthetics are important as when it is not in use it can be seen and this problem would need to be examined.
- The reason the tube pulls up so far is so as the water cannot enter the boat through the bailer when sitting stationary in the water.

The system I am going to re design is the elephant trunk. The reason for this being that the hole is 100mm and this means water can freely escape and cuts out blockage problems.

It scored the highest amount of marks in my evaluation yet I think there is a lot could do with this product to improve it, such as making it automatic.

Very Poor	☹
Poor	☹☹
Good	☹☹☹
Very Good	☹☹☹☹

Viability of Design Modifications following.

	Function and Purpose	Features	Materials and Industrial Production Methods	Evaluation of Fitness For Purpose	Analysis of Ergonomics	Aesthetic Suitability	Total
Screw Bung	4/10	4/10	4/10	5/10	7/10	6/10	30/60
Bilge Pump	6/10	5/10	5/10	6/10	7/10	5/10	34/60
Ball System	5/10	3/10	5/10	4/10	6/10	5/10	28/60
Expanding bung	5/10	5/10	5/10	7/10	7/10	5/10	34/60
Elephant Trunk	8/10	6/10	6/10	5/10	6/10	6/10	37/60



Evaluation of fitness for purpose

- This is not a very good system.
- The diameter of the hole is around 20mm and this is not wide enough to avoid the hole getting blocked.
- From experience this system does not allow a lot of water to exit at a quick enough rate, and often becomes blocked.
- This bung balls the water between the two hulls. The water gets into the boat through the anchor locker and deck fittings. The problem with this being that it quite often becomes very difficult to unscrew the bung as the air between the two hulls has expanded and increases the friction on the screw.
- This system can only be used out of the water.



Evaluation of fitness for purpose

- This is a good system.
- If the battery goes dead the baller cannot be used and sometimes the baller can be the cause of the battery going dead.
- The impeller sucks up tiny stones and small fragments of dirt causing it to break meaning a new pump is needed.
- There have been incidents of this system catching fire.
- This system is quick to use and is not that noisy.
- This system is particularly useful if rain water gets into the boat while afloat.



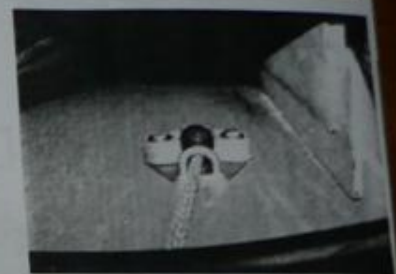
Evaluation of fitness for purpose

- This is a modern system and only comes standard to few boat makes.
- This makes them difficult to find or replace.
- It is necessary to continuously clean this system as the ball sticks a lot due to seaweed residue and leaves.
- The ball does not 100% cover the hole when the boat slows down so there is always water entering the boat slowly.



Evaluation of fitness for purpose

- This baller is very simple to use thus it is a good system.
- Similarly to other systems, the hole is easily blocked.
- Another more costly problem is that the rubber part that expands cracks due to heat. This means a new bung has to be purchased.
- These are old systems so it can be difficult to find replacements.



Evaluation of fitness for purpose

- This baller is very simple to use as the mechanism is simply a rope pulling the tubing up or letting it down.
- Unlike previous systems, the diameter of the hole is quite large which stops it getting blocked and causing problems.
- The problem with this system is that the tubing is not solid and when the system is being used out of the water it creases and the water is not heavy enough to pass through the crease.
- This system allows a large quantity of water to get out quickly.

Analysis of Ergonomics

- The ergonomics of this system are good.
- It is very simple to use as it is just a screw.
- To operate the bung you unscrew it in an anti-clockwise direction.
- It has a device so as the bung stays connected to the boat when unscrewed. This saves finding somewhere to put it or losing it.
- This bung would only be used when out of the water.

Analysis of Ergonomics

- Again the ergonomics are good.
- This is an automatic system so although it will drain water automatically, the user must be cautious it does not drain the battery or overheat.
- The user has a switch with two options on the console. The first option is automatic and the second option is manual which means you have to hold down the button to activate the baller.

Analysis of Ergonomics

- This is the same idea as the bilge pump in that it is automatic however it is not electrical so there is no worry of it overheating or going on fire.
- The system is operated by the pressure of the water pushing it.
- In my opinion this system is better because there is less that can go wrong and there is only one working part.

Analysis of Ergonomics

- The ergonomics of this product could be better. The plunger can be stiff for the user and they have to leave the steering position and take off their kill cord to operate the system which is a safety risk.
- The lever would need to be longer to make the action easier for the user.

Analysis of Ergonomics

- The ergonomics of this product is good as the product looks easy to use and in this case it is very easy to use.
- Although, you do have to leave the steering position to go to the stern of the boat to lower the system and return to the steering position. This is dangerous as you will have to take the kill cord off which stops the boat if you fall out.



Function and Purpose

- The function and purpose of this system is to allow water in the boat to drain out while out of the water.
- It is self controlled which is why it can only be used out of the water.
- It is located on the transom of the boat, at the bottom of the hull.
- These bungs are priced at around £4.99

Features

- This is a simple system.
- It has a plastic bung with threads that screws into a threaded corresponding hole.
- The hole is connected to the hull by two stainless steel bolts and a waterproof sealant.



Function and Purpose

- This system is automatic and connected to a 12v battery.
- It was designed to make bailing a boat easy and quicker.
- It works by a float switch.
- When the water gets to a certain level the floats lift and the automatic bailer will start.
- The impellor in the casing sucks up the water and forces it through a hose out the back of the boat.
- The electric bilge pump is designed to be used both in and out of the water but there are some problems which are highlighted in later sections.
- The bilge pump is priced at around £30

Features

- This system is operated by a 12v battery.
- It has a small plastic impellor inside a casing made from urea formaldehyde.
- The water is forced through a strengthened hc into the sea.
- The float switch is also urea formaldehyde filled with foam so as the water can activate it.



Function and Purpose

- This bailer is automatic.
- When water is inside the boat the ball is pushed away from the plug and the water is forced out.
- When stopped, the force of the water pushes the ball back over the hole and so stops water going back into the boat.
- This bailer is designed to work in the water but it can be used out of the water as well. This is a fairly new system and it can be difficult to find replacements for.

Features

- This is an automatic system.
- It has an acrylic case with a very light polypropylene ball so that it can move easily with little water pressure needed.



Function and Purpose

- Manual bailer.
- Expandable bung.
- When the lever is set at a ninety degree angle red rubber expands and blocks the hole.
- When the bung is out there is a non return flap meaning when the boat stops the amount of water entering the boat caused by the stern wake and change in velocity, is reduced to a minimum.
- This bailer is designed to work in and out of the water and has a return flap to avoid water entering the boat when speed is reduced.

Features

- Manual system.
- Lever to activate the rubber bung expansion.
- Non return flap to reduce amount of water coming back into the boat.



Function and Purpose

- Manual bailer.
- Large hypalon tubing.
- Connected to the hull by a jubilee clip and sikoflex which is a waterproof sealant.
- The purpose of this system is to manually remove water from the boat by lowering the tubing using a small rope and allowing the water to run out.
- The bailer is designed to work in and out of the water but there are a few problems which are highlighted in later sections.

Features

- Manual system
- Hypalon tubing to allow water to escape.
- Rope to operate system.
- Jammer cleat to hold tubing up when not being used.
- Jubilee clip to hold tubing to boat



- Injection moulded.
- Polythene - high density.
- Waterproof seal (sikoflex).
- Two stainless steel screws.
- Rubber washer for tight fit on threaded bung.



- Urea Formaldehyde casing and impellor.
- PVC hose with wire support
- Stainless steel jubilee clips.
- The casing is injection moulded and the two halves clip together



- Acrylic casing.
- Waterproof seal (sikoflex).
- Four stainless steel screws.
- Injection moulded polypropylene ball - light.
- The casing is injection moulded and screwed to the deck.



- Polythene lever.
- Rubber bung.
- Hypalon non return flap.
- Both halves are injection moulded and joined together by a plastic doul which acts like a pivot.



- Hypalon tubing.
- Stainless Steel jubilee clip.
- Nylon rope.
- Alloy jammer cleat.
- This system is formed by null flat sheet of hypalon and glued edge. There is then a stainless Steel eyelid fitted for the rope



BEST
TASTE
HIGHLAND
SPRING
Still
Spring Water
PLEASE DRINK RESPONSIBLY TO ENJOY CLEAN TASTING TOGETHER

AS Unit 2: Product Development
GCE Advanced Subsidiary Examination
CANDIDATE RECORD SHEET: Summer 200...

AS
GCE Advanced Subsidiary Examination
CANDIDATE RECORD SHEET: Summer 200...
Centre name: _____
AS Unit 2: Product Development
Criteria
Maxi...

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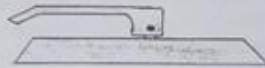
Criteria	Max mark	Awarded	Comments	Signature

Evaluation

Overall, my final product followed my re-design specification fairly well. Despite the few problems that occurred during manufacture and testing, I am pleased with the product. Below are changes I would make to the product if I was able to make it again.

Future Modifications:

- One of the most obvious modifications that could be made to the product is to make new levers that are longer than the current levers.

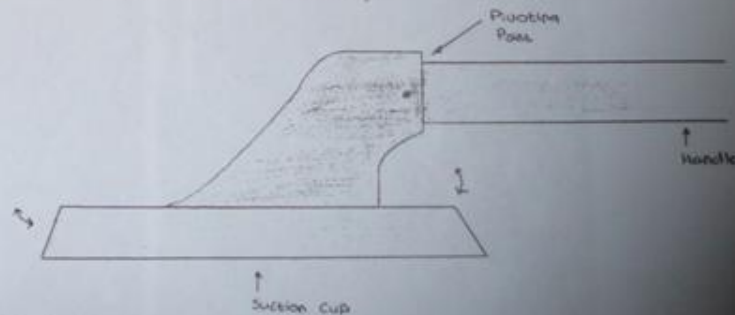


Beveled lever



Hook shaped lever

- Another modification that could be made is to have the pivoting point built into the handle. This would eliminate the need for the aluminium brackets, instead, the bracket would be made of plastic and would be moulded into the suction cup.



Finally, the testing section proves that the finished product performs as originally expected when I started the manufacturing process.

Evaluation Against Re-Design Specification

Function:

- The product should be capable of carrying a wide range of non-porous materials ranging from glass to sheet metal, but this cannot be tested as it is only a prototype.
- One of the suction heads pivots to allow the carrying of curved materials such as a car windscreen.
- The lifting suction head is capable of being "locked" to prevent unwanted movement by the use of a pin and nut. This however, is not sufficient to lock the heads when lifting a large load. When the suction heads have been attached to a surface, the heads will not move despite the pin. The pin is mainly to keep the heads locked when not in use.
- One of the suction heads includes storage for window packers. The space is sufficient for a pair of packers, however, it can be quite difficult to remove the packers from this space without tipping the product upside-down. I have not fitted a level to the suction cups.

Size:

- The product is compact enough that storage is not an issue. The rubber suction pads are larger than 115mm to enable the theoretical lifting of large loads.
- The product is smaller than 400mm to make storage easier.

Cost:

- The product did not cost more than £15 to manufacture.

Aesthetics:

- The product is constructed from a bright orange plastic which improves its aesthetic appeal.
- The only sharp edges on the product are those found on the aluminium brackets. Despite this, they are not sharp enough to cause injury.
- More than one colour was used in the product which further improves aesthetics.
- I feel that the product looks in proportion as the suction cups are not too big of the handle that I have manufactured.

Ergonomics:

- The handle is made of circular plastic which is the easiest shape to hold in your hand.
- Despite using the levers of another product, they are of good length which makes it easier to apply the suction force.
- The product is reasonably lightweight.
- The product is self explanatory. The most complicated aspect of the product is the lifting mechanism which requires the user to tighten or loosen a pin for the head to move.
- The handle has grooves that improve grip and make it much more comfortable to hold for long periods of time. These grooves, however, do not necessarily fit to the natural position of the hand. This does not affect the improved grip and comfort the handle now incorporates.

Materials and Production Methods:

- The majority of the product has been constructed from plastic. This gives it a good surface finish and allows it to be produced in a wide range of colours.
- The brackets between the handle and the suction cups have been made from aluminium which is lightweight and has a good appearance.

Safety:

- The hand grip helps improve the grip the user has with the product.

Time:

- I completed the product within the set time limit.

Criteria	Maximum mark	Mark awarded	Folio Page No.	Comment

Testing



This is my final product. In this section, I will be testing and evaluating my finished product. I will test the product against my original re-design specification to ensure that my product performs as expected.

Handle:

This is very important part of my project as it is what the user will hold during operation of the product. In my specification, I stated that the handle must be comfortable to hold and also have a hand grip to make carrying heavy loads easier. After testing the product, I have found that with the addition of grooves, the handle is very comfortable to hold, in all positions as shown in the pictures. The only problem with this handle design is that each of the grooves, of which there are four, will not necessarily accommodate the natural position of the hand.

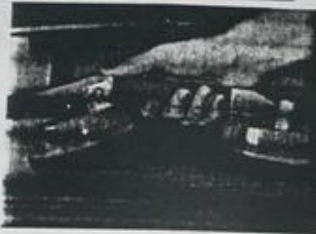


Window Packer Storage:

In my specification I stated that the product must include storage for window packers. The final product includes space for two window packers and also includes a pin and thumb screw to help secure the packers. When stored, the packers sit flush with the top of the suction head. The only fault with this method of securing the packers is that it can be quite difficult to remove. As a result, the product may need to be turned upside down to remove the packers.



Tilting Bracket:



This is the tilting bracket on my product being tested. In my specification, I stated that the suction heads must be capable of pivoting and they also must be lockable to prevent unwanted movement. The tilting bracket provides a wide range of movement as shown in the picture. The pin also allows the bracket to be "locked" in place, however, the pin will not be able to prevent movement when large loads are lifted. This is a minor problem as the pin works perfectly with no load and it is not needed once the suction pads have been attached to the material.

Testing On Car Windscreen:

Here is the product being tested on a curved glass surface. One photo is with the product in the straight position, the other shows the product in the tilted position. As you can see, it is particularly effective when a curved glass surface needs to be lifted, as the heads adapt to the curve of the surface.

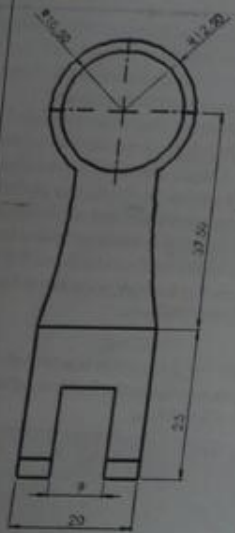


→
Tilted

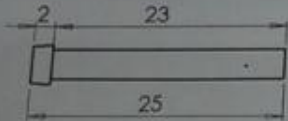


Working Drawings

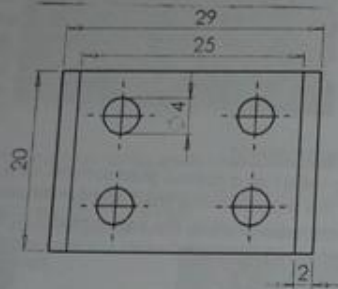
Lever:



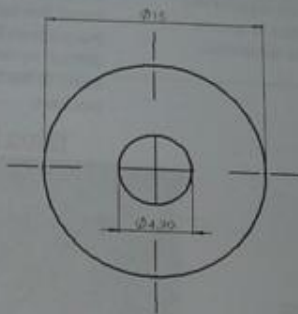
25mm Bolt



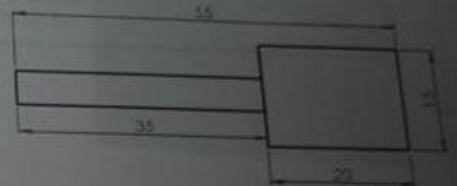
Tilting Bracket Attachment



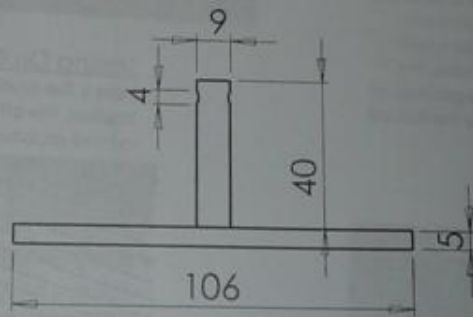
Nut For Tilting Bracket



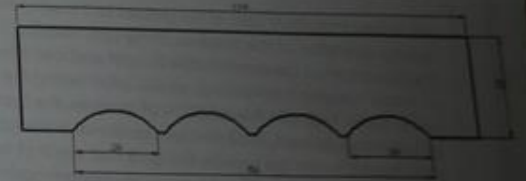
Pin For Tilting Bracket



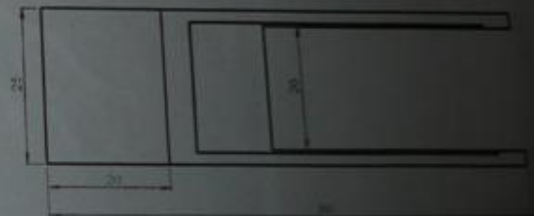
Rubber Pad And Pin



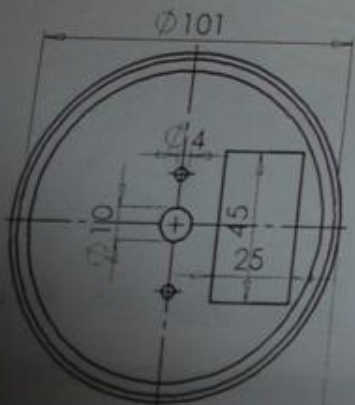
Handle



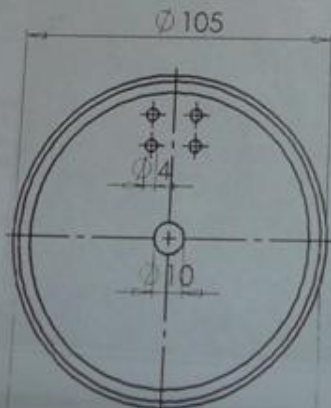
Tilting Bracket



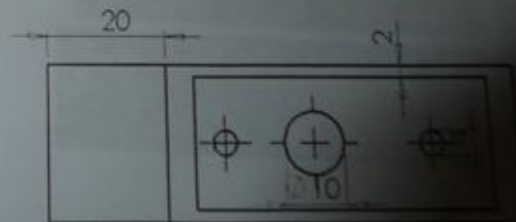
Fixed Suction Cup



Tilting Suction Cup

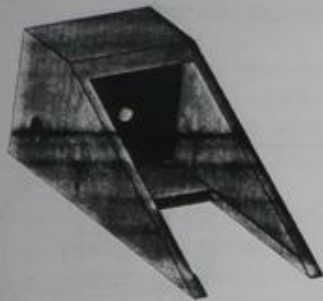


Fixed Bracket



Parts Drawings

Investigation and analysis of product	No.	Worksheet	Level	Topic	Supplier	Grade	Comment
20	16		4				



This is the tilting bracket. The wooden block has been press fitted into it through the use of a vice. The space which has been cut out from its base allows the lever to remain separate to it when it tilts.



Here is the fixed bracket. This bracket has been attached to the suction cup directly through the use of a 25mm screw. As this bracket does not move, the lever can rest directly on it and so a hole has been drilled through the middle which allows the pin from the rubber pad to protrude through.



This is the pin and nut that is used to secure or loosen the tilting bracket. It has been knurled on the lathe to improve grip so it is easier for the user to turn.



This is a 25mm screw that is used to attach two components to the suction cup. It is used to attach the fixed bracket and also the tilting attachment securely. It can easily be tightened through the use of a flat head screwdriver.



This is the suction cup for the fixed bracket. The storage space for the window packers is clearly visible with enough room to store two window packers. There are also three holes. Two for the screws to attach the fixed bracket to it and the other is for the pin from the rubber pad.



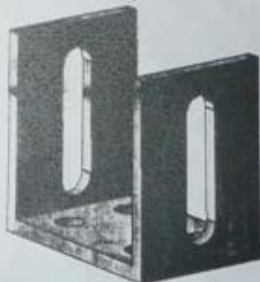
This is the suction cup for the tilting bracket. The four smaller holes are for use in fastening the tilting attachment to this suction cup. The larger hole is for the pin that is attached to the rubber pad.



This is the handle which includes an ergonomic hand grip. The grooves which have been filed into the handle have even spacing between them to allow it to fit comfortably into the hand. The handle has a hole in the centre of either end to allow it to be attached to the wooden block in each bracket.



This is the lever that is attached to the rubber pad through the use of a small pin. It has a criss-cross pattern on its end that, as well as improving its ergonomics, helps improve its aesthetics. The lever is long in length to make it easier to gain leverage.



This is the tilting attachment that allows the tilting bracket to pivot. The long slots allow for a wide range of movement. The four screw points reduce the risk of any



This is the rubber pad. There are four screw points on the suction cup. These points reduce the risk of any

Plan of Manufacture

Suction Cups

- I will create two moulds made out of MDF by marking out a circle on a square block of MDF and, through the use of a jig and the linisher, create a pair of circular moulds
- Again, through the use of the linisher, I will add a 10° slant to the edge of each mould to improve its aesthetics
- I will then add a thin disc of wood (MDF) that has a larger diameter than the suction cup to create a "lip" around the edge of each suction cup, securing it with double-sided tape
- On one of the moulds, I will mill out a rectangle 8-10mm deep to create a storage space for packers when the suction cup is formed
- Using the vacuum former, I will form the two suction cups and remove the excess plastic, finishing the edges to a high standard

Metal Brackets

- Next, I will make two metal brackets, one fixed and one pivoting, from 25mm box aluminium
- I then will cut two 80mm sections of this aluminium and, through the use of the bandsaw, will cut each 80mm length of bar down its diagonals
- I will file and polish these cut edges to a smooth finish using a file, emery cloth and wet & dry paper
- After this, I will plug each end of each bracket with a cube of hardwood to enable the handle to be attached to each bracket
- On the fixed bracket, I will drill two 4mm holes to secure it to the suction cup and an 8mm hole to allow the metal rod from the rubber pad to reach the lever (I will also drill these holes through the formed suction cup)
- On the tilting bracket, I will cut out the bottom to allow the lever to remain on the suction cup while the bracket tilts
- I then will drill a 4mm hole through the side of the tilting bracket for a pin that will also pass through the tilting attachment

Tilting Attachment

- From a U section of aluminium, I will mark out on either side a slot that will be milled out to allow the tilting bracket to move up and down
- Using the mill, I will create a slot of about 4mm
- I will then drill four holes, all at 4mm that will attach the tilting attachment to the suction cup

Pin for Tilting Bracket

- Using the lathe, I will drill a large hole through a rod of aluminium that will allow a nylon insert to be fitted into it through an interference fit
- I then will knurl the aluminium for grip
- I will then use the lathe to take down a piece of nylon sufficiently to create an interference fit with the aluminium
- I will then drill a 3.9mm hole through the nylon and push a 4mm threaded bar into it, then, this nylon will be pushed into the aluminium
- I will glue the 4mm bar into place to ensure no movement
- Then, I will create a smaller nut to fit onto the end of the threaded bar with aluminium and a nylon insert (interference fit)
- This aluminium nut will also be knurled
- I then will tap the nylon so it can be screwed onto the 4mm bar

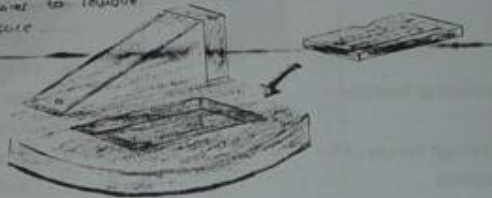
Handle

- I will cut a 110mm length of plastic to form the outside of the handle
- Again, using the lathe, I will create a nylon insert for the handle that is the same length
- On this nylon insert, I will drill a hole through its centre at 4mm so it can be attached to the brackets with 4mm bar
- I will mark out grooves on the handle for added comfort
- Using a half round file, I will create these grooves, all with equal separation and depth
- I will then use emery cloth and wet & dry to improve the finish of the filed grooves
- Finally, using the polisher, I will bring the grooves up to the same high quality finish as the rest of the plastic

Development Of Ideas



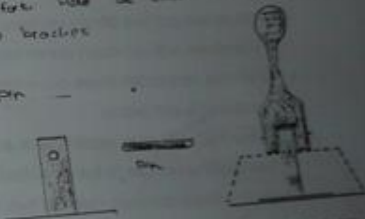
Level and Storage
 Larger level on suction cup
 Added storage space for window
 pockets. The groove in the pocket
 makes it easier to remove
 from the space.



End view

One piece handle with hand-grip to
 increase comfort. Hole at each end of handle
 to attach to brackets.

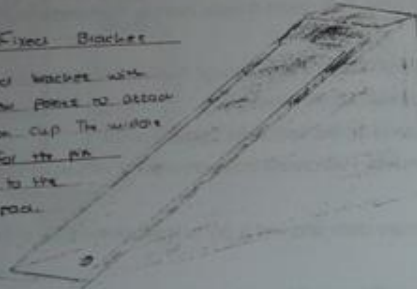
Level and Pin



Showing how the pin, which is attached to
 the rubber pad, would be secured to
 the lever.

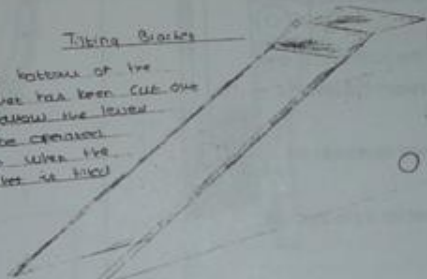
Fixed Bracket

The fixed bracket with
 two screw points to attach
 to suction cup. The window
 hole is for the pin
 attached to the
 rubber pad.



Tilting Bracket

The bottom of the
 bracket has been cut out
 to allow the lever
 to be operated
 over when the
 bracket is fixed.

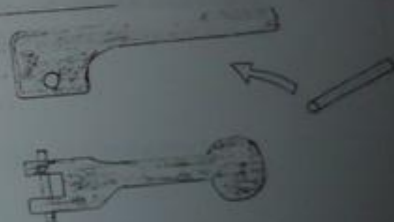


Suction View

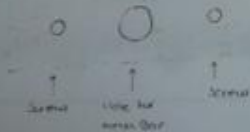


Lever

The lever with
 grip and
 ergonomic design.



Bottom view



Bottom of Attachment



PIN

Conclusion

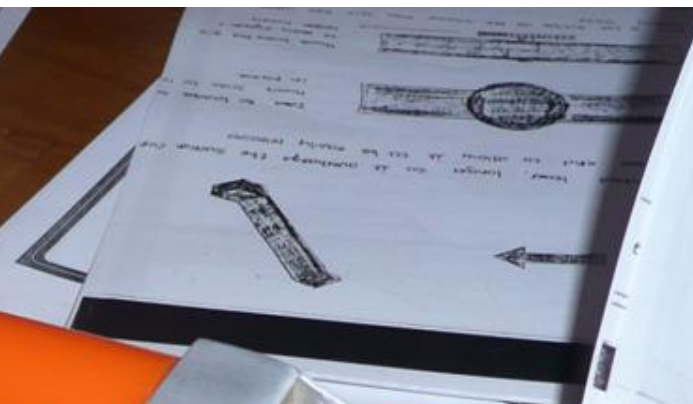
All of the above are improvements of my original ideas.



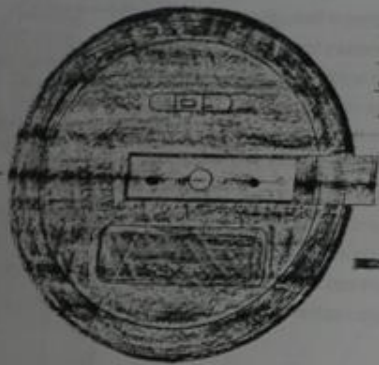
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Investigasi / Analisis	20			
Re. Desain Sistem	30	19		
Re. Detektor		19	20	
Manufaktur	40	28		
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8		35		



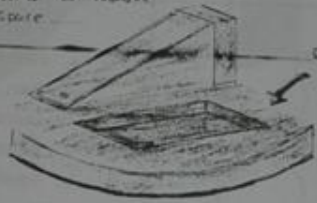
Handwritten notes and a table on a document. The table has columns for 'No', 'Kategori', 'Detail', 'Keterangan', 'Tanggal', and 'Status'. A red pen is visible at the top left, pointing to a cell in the table.



Development Of Ideas



Level and Storage
 Larger level or suction cup
 makes storage space for window
 pockets. The frame in the pocket
 makes it easier to remove
 from the space.



End view

One piece handle with hand-grip to
 increase comfort. Hole at each end of handle
 to attach to brackets.

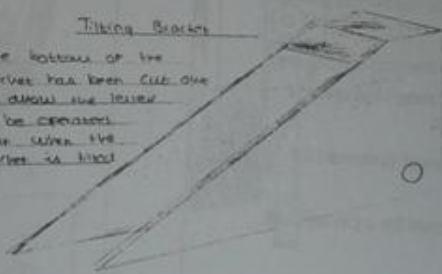
Fixed Brackets

The fixed brackets with
 holes across points to attach
 the suction cup. The wedges
 hole is for the pin
 attached to the
 rubber pad.



Tilting Brackets

The bottom of the
 bracket has been cut out
 to allow the lever
 to be operated
 even when the
 surface is tilted.



Level and Pin



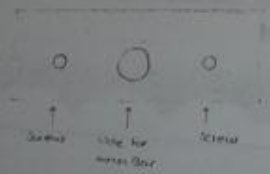
Showing how the pin, which is attached to
 the rubber pad, would be secured to
 the lever.

Lever

The lever with
 grip and
 ergonomic design

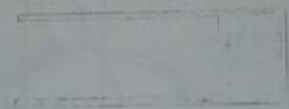


Front view



Screw Hole for handle bar Screw

Bottom view



Bottom of Attachment

Pin



Tilting attachment
 Square attachment pin

Conclusion

All of the above are improvements of my original idea.

AS Unit 2: Product Development

Criteria	Maximum mark	Mark awarded	Folio Page No.	Comment

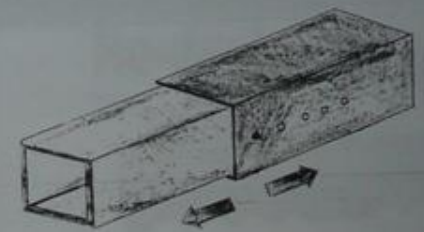
Features



Extendable handle at each end at both suction cups. This may be too time consuming to use



A split level built into a suction cup. This will be very useful for installing windows



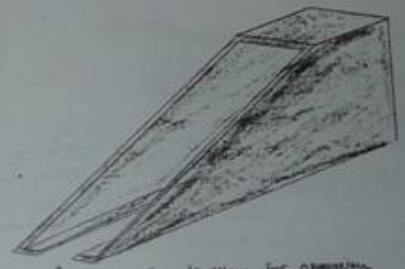
Square handle that can be separated for storage of fully retracted to make the overall size much smaller

This method is not suitable for an extendable handle. It is a square prism of which will hold also, will be time-consuming adjust the length of the handle

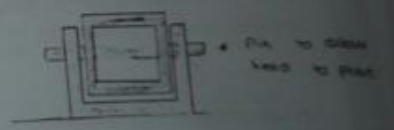
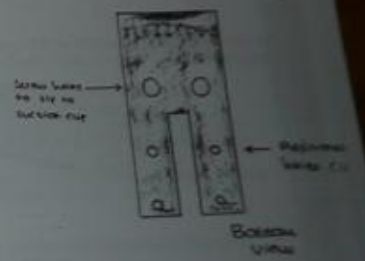
This method of a pivoting head does not provide a good degree of movement and is therefore not suitable



For a fixed head the would have a raised surface for the bracket to keep it on the same level as the adjustable head

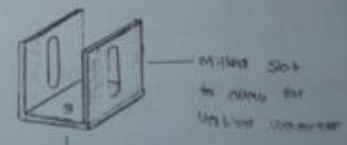
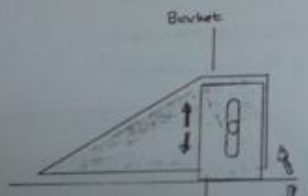


The above bracket provides the easiest method to attach the suction cup to the handle



This bracket allows the head to be 'locked' into position through the use of a pin that has had a square end

This bracket will allow for the greatest movement of the suction head, but also will not break due to the



Ergonomics



Adds grip on handle, enables two hands to be used

Two grips allow user to use both hands. This makes the user and tool comfortable to lift heavier loads.



Modified lever, longer so it outweighs the suction cup curved end to allow it to be easily released



Movable plastic sleeve to cover folding mechanism and to keep handle straight. This is the sleeve - the sleeve would continuously slide about the handle



Iron for fastening the thumb screw to hold in position

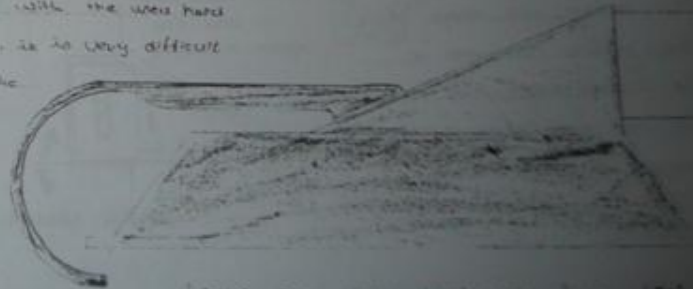


Thumb screw will grip to easily tighten & loosen handle

This is not suitable as the handle may split apart when lifting heavy loads



Extending handle with a thumb screw that may interfere with the user hand however, it is very difficult to make



Levers are made longer and bent 180°

Sleeve was to tighten the folding handle the sleeve has grooves to create

Section 1 - An...
 Date: _____
 Name: _____

Conclusion Table

	Conclusion
Aesthetics	The product needs to be aesthetically pleasing. Using coloured plastic as the material for the body is likely to achieve a good aesthetic appeal. This also means there is a wide range of colours to choose from.
Ergonomics	Ergonomics of this product must be very good as it may be used to carry heavy loads. The user must have a good grip on the product that fits into their hand. It must be comfortable to hold for long periods of time. The levers also must have good ergonomics as some force may be required when pushing the levers into position.
Materials And Production Methods	The product will be mostly constructed of plastic. This ensures good durability while allowing for an aesthetically pleasing product.
Cost	The product should cost £15 to £25 to manufacture.
Safety	The product must have a maximum load of at least 30kg to ensure safe operation with many loads.
Design Features	The product must have a pivoting head to allow for lifting of curved surfaces. It also must have a storage space for window packers.

Re-design Specification

Function:

- The product must be capable of carrying a wide range of non-porous materials ranging from glass to sheet metal.
- The suction heads should be capable of pivoting to allow materials with a curved surface to be carried.
- The suction heads must be lockable to prevent unwanted movement.
- Storage for window packers must be included in the suction head and well as a level.

Size

- The product must be small enough to be compact for storage, but must be large enough to enable it to be extendable to a useful length. The diameter of the suction cups should be no smaller than 11.5mm to guarantee that the prototype would be suitable for lifting large loads.
- The product must be no longer than 400mm. This is to prevent the handle from breaking if a large load was to be carried.

Cost:

- The cost of the prototype should not exceed £15 to make it affordable to the consumer.

Aesthetics:

- The product must be aesthetically pleasing such as those available on the market already. As the body is to be constructed from plastic, it will be available in a wide range of colours.
- The product will have rounded edges like many of those on the market to increase its aesthetic appeal.
- More than one colour will be used in the product. The body will be one colour, while the levers will be different. This contrast will help to improve the products aesthetics.
- The product should have a company logo to help increase its aesthetic appeal.
- It must look in proportion to have an attractive aesthetic appeal.

Ergonomics:

- The handle of the suction lifter must be made of a comfortable material to improve how the handle feels in the user's hand.
- The levers used to create the vacuum must be of good length to allow for good leverage so that the user can easily create a strong vacuum.
- The product must be lightweight.
- It must be easy to operate when finished so that the consumer is not put off by complicated operating instructions.
- The handle must have a hand grip to make it more comfortable to hold for long periods of time and with heavier loads.


Materials and Production Methods:

- The body will be constructed from plastic because of its good surface finish, strength and the ability that it can be injection moulded for mass production. For the prototype, I will be using vacuum formed rigid polystyrene to create the body.
- The connecting pins between the suction cups and levers will be made from aluminium because of its strength and it is lightweight, reducing the weight of the final product. Turning on the lathe will be used to create these pins.


Safety:

- The handle grip will decrease the possibility of the product slipping from your hands.


Section 1 - Analysis

	Rubber suction lifter	Rating
Fitness For Purpose	A high quality plastic suction lifter capable of lifting heavy materials. The product is quite large in length, measuring 400mm and this may cause a problem for storage. This product is capable of lifting loads of up to 30kg which many consumers are easily capable of carrying comfortably. It is a plastic alternative to metal suction lifters, but still includes many ergonomic and aesthetic features that make this a high quality product.	8/10
Aesthetics	The aesthetics of this product are quite good and are a result of the plastic used in its construction. ABS plastic provides strength for the product, but also gives the product an excellent final surface finish and scratch resistance. Yellow and black colours have been incorporated into the product and the two colours complement each other, making the product very aesthetically appealing.	7/10
Ergonomics	This is a well designed product designed to be very comfortable to use. Unlike other suction lifters, it has a long, rounded handle so there are no corners that make lifting large loads uncomfortable. Its length allows the user to use two hands when carrying large loads. The handle has been given a rubber grip which also makes it more comfortable to carry heavy loads. It has large levers which look out of proportion, however, they make applying suction easier for the user.	8/10
Materials And Production Methods	The body is made from ABS plastic that would be injection moulded to reduce costs. The plastic is scratch resistant and has good strength making it a good material for this product. The levers are injection moulded from PVC because of the large numbers that are needed. The rubber handle is heat shrunk to the body to prevent it from becoming loose. Again the pins connecting the suction cups to the levers are made from aluminium because of their strength.	7/10
Cost	This is an expensive suction lifter at £50 despite being nearly entirely made from plastic. The ergonomics are what make the product more expensive compared to other similar plastic lifters.	7/10
Safety	With a lifting capacity of 30kg it can safely lift many items, but there is a slight risk that the levers may be accidentally released during use because of they extend over the suction cup when engaged, allowing whatever is being carried to drop.	5/10
Design Features	Designed to look aesthetically appealing, but also to be comfortable to hold when being used to lift loads.	8/10

- ✓ Large, comfortable handle
- ✓ Good aesthetics
- ✗ Cost
- ✗ Difficult to store
- ✗ Expensive

	Double suction lifter	Rating
Fitness For Purpose	This low cost product is simple in design but is still functional. It has no other capabilities other than lifting flat materials such as glass. More features could be added to the product to increase what it's capable of. The product has a maximum lift capacity of 30kg which is quite impressive for a low cost product. This is quite a small product of 360mm long. This makes it easy to store in a tool box but may make the product quite difficult to use.	5/10
Aesthetics	This product has relatively poor aesthetics and only the yellow plastic gives it an acceptable aesthetic appearance. As a low cost product, an effort has been made so the cost remains low and aesthetics has suffered as a result. The ABS plastic used in the construction of the product gives the product a good surface finish that is scratch resistant.	4/10
Ergonomics	As a low cost product, ergonomics were not a main focus of this product. It has been designed to do only what is required from it and no more. The handle is constructed from the same material as the rest of the product (ABS plastic) and does not have any grip. The levers are quite small, which may make it harder for the user to create a strong and secure vacuum to lift materials. As it is entirely made from plastic, the product is very lightweight, which may make it feel cheap and therefore of inferior quality.	4/10
Materials And Production Methods	The main material used in this product is ABS plastic. It has been used to reduce the cost of production as it can be easily injection moulded. As this is a mass production product, injection moulding was the obvious production method as it is capable of producing large quantities while keeping costs to a minimum.	6/10
Cost	A very cheap product of £8.50. This is good value and makes it an attractive option for many people. The low cost of the product does not reflect its capability. Consumers may presume that it has a small load capacity even though it has a 30kg max load.	7/10
Safety	To keep costs low, designers have tried to minimise the amount of material used and it appears that the length of the levers is quite short affecting ergonomics as well as safety. This is a safety concern as the user may not be able to create a strong vacuum which may lead to the item which is being moved, dropping.	4/10
Design Features	This product is a low cost suction lifter that has a basic function, to lift loads up to 30kg. It is designed to be as cheap as possible to help increase sales.	5/10

- ✓ Low cost
- ✓ Good load capacity
- ✗ Poor ergonomics and aesthetics
- ✗ More difficult to use


	Triple suction lifter	Rating
Fitness For Purpose	With an extra suction cup, this lifter is more capable of heavy loads. It has a maximum load of 35kg. Despite being able to lift more, users may find it better to buy a pair of double suction lifters for more lifting power because they can use both hands to lift the material. This suction lifter allows materials such as a sheet of glass to be lifted vertically, therefore allowing users to lift larger sheets than possible with a double suction lifter.	5/10
Aesthetics	With a simple design and one colour, this product is not particularly aesthetically pleasing. The silver finish of the product is quite dull and looks plastic even though it has been cast from aluminium. A rubbed effect has been added to the edge of each suction cup in an attempt to improve the products appearance. The lack of colour used in the product makes it quite unattractive compared to plastic alternatives which are supplied in a variety of colours.	5/10
Ergonomics	Ergonomics of this product are quite basic, with the location of the handle, materials can only be carried vertically, which may be useful for some applications, however, may prove uncomfortable for the user. The handle is cast from aluminium with no grip, which may make carrying large loads uncomfortable. Cast from an aluminium alloy and with 3 suction cups, the product is heavier than many double suction lifters at 990g. The weight of the product adds to the total weight of the load the user has to lift.	4/10
Materials And Production Methods	The body of the suction lifter is sand cast from aluminium because of its strength and it is lightweight. The pins are also made of aluminium, however, they have been die cast to increase the speed of production and help lower costs. The levers have been injection moulded also in an attempt to keep costs to a minimum.	6/10
Cost	At £29, this is a good value product for its lifting capabilities.	7/10
Safety	With a GS (Geprüfte Sicherheit) safe capacity, the product has been certified to carry loads of 35kg easily. Carrying materials such as sheets of metal vertically may prove to be quite dangerous.	5/10
Design Features	This product has 3 suction cups to help increase its lifting capacity. The position of the handle also allows loads to be carried vertically.	6/10

- ✓ Triple suction heads
- ✓ Lifting capacity
- ✓ Vertical lifting
- ✗ Very poor aesthetics
- ✗ Difficult to store




Conclusion


Section 1 - Analysis

	Clarke Suction Lifter	Rating
Fitness For Purpose	This product is a low cost suction lifter and has a good lifting capacity for its relatively low cost. The extendable handle allows the lifting of different sized materials. The product is 400mm from suction cup to suction cup, but when extended, this increases to 420mm. The suction lifter has a lifting capacity of 40kg, which is more than adequate for many applications. Its length can make the product difficult to store, so may not fit into a toolbox.	8/10
Aesthetics	Despite its large load capacity, the product does not have an industrial appearance. It is an aesthetically pleasing product and was obviously considered during the design phase. The use of two colours (red and black) adds to the aesthetics as well as the use of the Clarke logo on the product. This allows the user to easily associate the product with its manufacturer. Constructed mainly from plastic, the product has an excellent surface finish that has a degree of scratch resistance.	8/10
Ergonomics	This product has relatively poor ergonomics. The extendable handle may be an excellent feature, however, it has poor ergonomics. It looks quite uncomfortable to hold, especially if lifting weights up to 40kg. The handle, being made of plastic, may be quite slippery as it is not coated with a rubber grip. Even though it is capable of carrying large loads, it may not be possible to carry a large sheet of glass as this is a handheld product and materials can only be carried horizontally.	4/10
Materials And Production Methods	Most of the components of this product would be injection moulded to increase the speed of production and to lower production costs. ABS plastic would be used for the injection moulding process because of its strength and lightness. The pins connecting the suction pads to the levers are constructed of aluminium and are produced through die casting because of the large numbers that have to be produced.	7/10
Cost	At £25, this is a consumer level product. For the features this product has, it is a good price compared to other suction lifters with similar capabilities.	7/10
Safety	Although this product has no official safety rating, it still appears safe to use because of its large suction cups and its lifting capacity (40kg).	6/10
Design Features	The extendable handle of this product is the main function that would be appealing for a consumer.	8/10

- ✓ Extendable handle
- ✓ Attractive appearance
- ✓ Large load capacity
- ✓ Relatively cheap
- ✗ Poor handle ergonomics
- ✗ Difficult to store

	Draper Suction Lifter	Rating
Fitness For Purpose	This high quality suction lifter is lightweight, but strong and has a very large lifting capacity. Its maximum load capacity is 50kg which is much larger than many other double suction lifters. Despite this large lifting capacity, many users may find it difficult to lift anything that weighs 50kg with one hand. It is designed to lift only flat, non-porous materials and does this very well. It has few features, but its high quality materials make up for this. The product is 370mm long, making it more compact and therefore making it easier to store in a tool box. This, however, reduces the size of the handle, making it possible only to use it with one hand.	7/10
Aesthetics	The aluminium alloy used in this product gives it a high quality finish. The ribbed effect surrounding the suction cups also adds to the product's aesthetic appeal. Despite the high quality finish, the silver colour of the product is not particularly attractive compared to plastic alternatives that come in a variety of colours. This also gives the product an industrial appearance, which shows consumers that this is a high class product. There are no straight edges in the product, enhancing its aesthetics and it is well balanced because of equal components on each side.	6/10
Ergonomics	This product has a large handle so the user can easily lift large loads. The handle, however, is made of the same material as the rest of the product (aluminium alloy) and may not be very comfortable and would not provide any grip, so has poor ergonomics. Some thought has gone into ergonomics as there are small tabs on each suction cup to aid release from materials. The aluminium alloy increases the weight of the product making it heavier than other plastic products at 940g. It can only lift materials horizontally.	4/10
Materials And Production Methods	The main body of this product is made of aluminium alloy, which would be die cast. This process has its disadvantages as the cost for making the moulds can be quite high and therefore increase the price for the product. The levers are made of PVC plastic because of its strength and it can also be injection moulded, increasing the speed of production. Again, the pins connecting the suction cups are made from aluminium and are die cast.	6/10
Cost	This suction lifter is priced at £45 and is a more advanced product because of the materials used in its construction.	6/10
Safety	This product is capable of carrying loads of up to 50kg and has a safe working load of 25kg with any measure users that it is unlikely to drop anything weighing less than 25kg.	7/10
Design Features	This particular product's main feature is that it has a much higher lifting capacity than other twin head suction lifters.	7/10

- ✓ High quality materials
- ✓ Very large load capacity
- ✓ High quality appearance
- ✓ Fits in toolbox
- ✗ Price
- ✗ No grip for handle
- ✗ Can only be held with one hand

	Verbor Blue Line Suction Lifter	Rating
Fitness For Purpose	This is a top-of-the-range suction lifter and has been designed for industrial applications. It is very functional and has been designed very well. It has limited functions but more attention has been paid to ergonomics such as ergonomics and aesthetics. This product is capable of lifting loads of up to 10kg, which may not be necessary as users may not wish to lift such heavy loads or may not be capable of doing so. This is a very large suction lifter because of its large handle and long levers. Its total length is 410mm, which makes storage a problem.	9/10
Aesthetics	This product has been constructed of aluminium, with a blue rubber grip and blue levers. This gives the product a less toned appearance increasing its aesthetic appeal compared to lifters constructed solely from aluminium. As well as making the product aesthetically pleasing, it also gives it a very professional appearance. The long levers may make it easier to apply the suction, however the look out of proportion because they hang over the suction cup when engaged. The manufacturer's logo is engraved onto the levers which increases the aesthetic appeal. A sticker on the suction cup also allows the consumer to easily see what the product is capable of. Again, the product can only carry materials in a horizontal position.	9/10
Ergonomics	A great deal of thought has been put into the product's ergonomics to make it as user friendly as possible. A rubber handle has been used to make it more comfortable for the user to lift large loads. The levers used to create the ergonomics in mind. They are much longer than levers on similar products, making it easier for the user to create a vacuum.	9/10
Materials And Production Methods	The body and pins for the suction cups and levers have both been constructed from aluminium and make the product very lightweight, however increasing costs. The body would have been sand casted because of smaller production numbers but this can be expensive. The pins would be die cast because of the rate of production. The rubber handle would be heat shrunk to the handle for a tight fit. The levers appear to be injection moulded to reduce costs.	7/10
Cost	At £55 this is a very expensive product and is most likely for professional use. The materials make up for much of this cost.	4/10
Safety	Safety is very good in this product as it has been tested by the TÜV (German technical controlling institution).	8/10
Design Features	The product has been designed with the main focus on the ergonomics. This has resulted in the product having a comfortable handle and levers longer than those found on similar suction lifters.	9/10

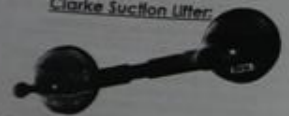
- ✓ Very well designed ergonomics
- ✓ Professional appearance
- ✓ Large levers
- ✗ Very expensive
- ✗ Very large and hard to store

Section 1 - Investigation

Introduction:

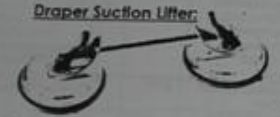
My name is _____ and this is my AS Technology coursework and it is worth 50% of my AS Level. I have decided that my coursework will be based around "suction lifters."

Clarke Suction Lifter:



This is a twin head suction lifter manufactured by Clarke. It has been designed to make lifting materials like glass and metal much easier and also much safer. This product has suction pads made from rubber. This material has been chosen because of the airtight seal it creates with the surface of the material, enabling it to create a strong vacuum force, preventing the material being lifted from slipping and therefore, being dropped. The special feature of this particular dual head suction lifter is that the handle is extendable, however, the handle cannot be locked into place. This allows materials of different sizes to be lifted without purchasing a bigger, more expensive product. The cost of this product is £25. ABS plastic is extensively used throughout the product allowing most of the product to be injection moulded, reducing the cost per unit. Carbon steel, formed through sand casting has been used for the connecting pin between the suction cup and lever because of its strength. Despite being constructed nearly entirely from plastic, the price is higher than other plastic suction lifters because of its extra functions. The plastic used also allows the product to be coloured, in this case red. Many other colours could be produced for this product. This model includes a Clarke logo moulded into the body. This increases the overall aesthetic appeal of the product and associates it with the manufacturer. The handle is cylindrical, this allows it to extend and also helps to improve the looks of the product. The product would be well balanced because of equal number of components on each side. The product is not large in its design, however, the extendable handle allows its length to be increased dramatically.

Draper Suction Lifter:



This suction lifter is manufactured by Draper. It can be purchased for £45. This particular model has been manufactured from a high density aluminium alloy. This reduces the weight of the product, without reducing its strength. The connecting pins are manufactured from mild steel because of the strength the part is required to take. The levers are injection moulded from ABS plastic because it is very durable. Its suction cups, made from rubber, have a diameter of 123mm, enabling it to lift materials with a smooth, flat, surface weighing no more than 50kg, such as glass and marble. Draper has tested the product and found that its safe working load is 25kg. The suction cups have a small tab of rubber to allow the user to remove the suction cups from the surface if a vacuum remains even after the tabs have been released. This reduces the risk of the user breaking the material being lifted by trying to pry the suction cups off it. A solid handle has been used in this product, meaning it cannot be adjusted to lift materials of different lengths. There is little plastic in this product, thus increasing its cost because of the production methods that have been used. The aluminium alloy has likely been die cast to increase the speed of production. The product is only available in the colour of the aluminium alloy, silver. To help improve aesthetics, a ribbed effect has been added to the edge of each suction cup. The suction cups are very large and may appear to be out of proportion to the size of the handle. This, however, enables larger loads to be lifted.

Double Suction Lifter



Veribor Blue Line Suction Lifter



This is a high quality suction lifter by Veribor from their Blue Line. The main material used in this product is aluminium. This makes the product highly durable, however, at a higher cost to the user. The use of aluminium means that die casting would have been used to create the shape of the product. Since this process requires special moulds, the cost of production increases. To enhance the ergonomics of the product, the manufacturers have included a handle and levers constructed from a "comfortable plastic." The levers are created through injection moulding because of the speed of production. This makes lifting products more comfortable for the user, especially since the lifting power of this suction lifter is 60kg in parallel. The levers are longer than most others on similar products, helping the user create a powerful vacuum. The handle is made of a blue rubber material to make lifting large loads more comfortable for the user. It is likely that heat has been used to shrink the rubber around the handle to generate a tight fit. Also, the rubber suction cups of this product enable it to lift airtight surfaces such as glass, plastic, metal, coated wood and marble. Mild steel is used to link the levers to the suction cups because of its high strength. As a result of the high quality materials used and increased ergonomics the product is more expensive than most other suction lifters at £55 for a single unit. The manufacturers justify the price of the product by highlighting the fact that the product has been tested by the TÜV (German technical controlling institution). This products aesthetic appeal has been increased by the use of coloured plastics combined with the aluminium alloy used for the body.

This is a low cost product, intended for small jobs by DIY enthusiasts. It is constructed entirely from ABS plastic, although mild steel has been used for the connecting pins and impact resistance, good strength and a high final surface finish. As a thermoplastic, ABS can be injection moulded. This greatly reduces the cost per unit if the production quantity is high. As this product is sold through a major catalogue company, the cost has been lowered to £6.50 per unit, making it popular with consumers. It has relatively large rubber suction pads at 115mm each. It is intended to lift non-porous materials such as glass and plastic of up to 30kg. The low number of components in this product helps keep the production costs low. The product has basic aesthetic qualities, but the high quality surface finish of the product helps to increase its aesthetic appeal.

Veribor Suction Lifter



This is a plastic suction lifter manufactured by Veribor. This particular suction lifter has a comfortable handle constructed from plastic to increase ergonomics, thus making it more attractive to the consumer. The rubber suction discs have a diameter of 120mm giving the product the ability to lift materials such as marble, plastic, metal and glass. The airtight rubber creates a strong vacuum force giving this lifter a maximum lifting weight of 30kg. ABS plastic is the main material used in this products construction, and this allows some of the components to be injection moulded, decreasing costs. Plastic has been used because of its strength and resistance to scratching. ABS plastic also has an excellent final surface finish which increases the products aesthetic appeal. Mild steel is also used for a small number of components, the connecting pins between the suction cups and the levers. Plastic could not be used here because it is likely that it would break. The cost of this product is £50. This is higher than most other plastic lifters because of the extra ergonomics incorporated into the product. The use of plastic in this product allows it to be made in different colours, making it aesthetically pleasing. The product appears to be quite long, but this is because of the large ergonomic handle.

Triple Suction Lifter



Here is a triple suction lifter that has been designed to lift very large loads. It has a maximum load of 100kg vertically but has a GS (Geprüfte Sicherheit) safe capacity of 35kg. The three rubber suction pads of 123mm each allow large weights to be lifted safely. The body of this suction lifter has been constructed from nickel plated aluminium, essential for large loads. The aluminium has likely been cast through the use of die casting because of the large number to be produced (economy of scale). The choice of material allows this suction lifter to be lightweight but strong. The aluminium has been coated in nickel because of its corrosion resistant properties. This nickel coating could have been applied through spraying or dip coating. ABS plastic has been used for the levers because it can be injection moulded to reduce costs and also because of its strength. The connecting pins are made from mild steel. The cost of this product is £29 and is relatively cheap compared to similar aluminium products. This is because of the large number of units produced as it is popular because of its large load capacity. Like most other suction lifters, this product can only lift non-porous materials such as glass and plastic. The product has a triangular shape because this enables the load to be evenly distributed between the three suction cups. It is also gray in colour because of the nickel

AS

GCE Advanced
CANDIDATE RECORD
Summer 200

Centre number

Candidate number

Modifications During Manufacture



Originally I had planned to just have one strip of metal running from the top to the end of the stapler as you will have seen throughout my folder, especially in the Solid Works Drawings, but after making and testing this idea I discovered it put the whole product off balance so I made the metal the full width of the gun, and a bit wider. I also continued the front over out round the sides of the gun, as to protect and balance it, doing two jobs at once.



Here you will notice how I have changed the overall design of the lever to allow for a better ergonomic factor, and a more comfortable use. It also goes better with the overall shape of the staple gun, as the overall shape is very curvy, and so if the lever was to remain what it was like before hand, as you will have seen in my solid works, it would look out of place and not aesthetically pleasing.



Here I had to change the shape of the safety trigger to make it work. If I had kept it the original shape the back end would have hit the roof of the staple gun and not fully activated. So by changing this I have created

Function	<ul style="list-style-type: none"> - The new design for the stapler gun does ensure that children are unable to activate the gun, and in the case of the gun being dropped, the safety trigger prevents accidental firing; - It does house an extra storage compartment for an extra round of staples to be stored. - The hand grip is comfortable to use and is superior to the previous stapler gun. - The new aluminium surface of the gun is rigid and durable; it prevents scuffing on the plastic. It can withstand the wear and tear of the surfaces it will be pressed against. - The lever on the gun is superior to the previous one as it is longer – allowing for less force to be applied, and it is more comfortable.
Fitness for Purpose	<ul style="list-style-type: none"> - The stapler looks aesthetically pleasing with the new contrasting colours – black and red - The new grip allows for longer periods of use, due to the improved ergonomic factor introduced to its design. - The extra storage compartments can hold a variety of different sizes of staples.
Aesthetics	<ul style="list-style-type: none"> - In my opinion the product looks stylish, modern and sleek. The red casing combines well with the black components, and the metal aluminium cover. - The outer casing looks more professional with the company logo –CLARKE- attached to the outer casing. - Due to how the product was produced it can be made in a variety of colours.
Ergonomics	<ul style="list-style-type: none"> - The prototype is lightweight and is able to be carried around for long periods of time, it weighs approximately 280grams. - For an adult or mature person the safety trigger can be comprehended, and is easy for such a person to use with ease. - The staples are easy to place in the magazine and the extra storage compartment. - The new lever and hand grip are quite comfortable, and easy to use. However the spacing between the finger slots may not suit all users.
Maintenance	<ul style="list-style-type: none"> - There are a few holes, cracks and crevices – so dirt may get in these and prevent the stapler gun from operating, be this is only a prototype. - The gun can be taken apart but not easily, in practise – it would probably have to be sent back to the manufacturer to be repaired.
Materials and Production Methods	<ul style="list-style-type: none"> - The materials are strong, however not fully resistant to impact as I do not believe the stapler gun would survive if dropped from a height, but the aluminium covering would help this. - I did incorporate wood, plastic and metal into my product. Where wood was used for producing the shape of the mould and in the production of the lever and safety trigger. Plastic was used to produce the mould and the outer shells of the lever and safety trigger. Aluminium was used in producing the protective cover around the outer shell of the gun.
Cost	<ul style="list-style-type: none"> - The product – after adding up the costs – does not exceed to price of £12.00.
Safety	<ul style="list-style-type: none"> - The new finger slots do not allow the users hand to slip when using under wet conditions. - The new incorporated safety trigger does not allow for accidental firing when dropped, of in any other circumstances. - There are no sharp corners or edges, as everything was rounded, even the metal cover.
Dimensions	<ul style="list-style-type: none"> - The total width of the gun was 32mm, and the overall length was 178mm so I kept to my measurements for storage and hand size.
Durability	<ul style="list-style-type: none"> - The outer materials are able to withstand slight impact, but are very easily scratched. - The inner workings are quite reliable, but if dirt or shock was to be put into the equation, I don't believe it would last that long.
Time	<ul style="list-style-type: none"> - The prototype was completed by March 2009.

Manufacturing Process

If this product was going to be mass produced it should be made via different means, than of that which I used to produce it, mostly because of the man hours I put into its planning and manufacturing. It quite simply would not be profitable or even realistic.

I believe the shell of the product would be injection moulded to prevent wastage of materials, and because the process is relatively quick. The handle and the safety trigger, in the same instance should be either blow moulded or injection moulded to cut down on time and wastage.

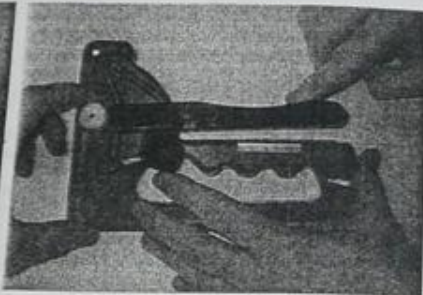
The aluminium cover would be made from a single piece of metal – not aluminium as it is not all that durable and resistant to scratching. These are the three main modifications that I thought of and made.

Future Modifications

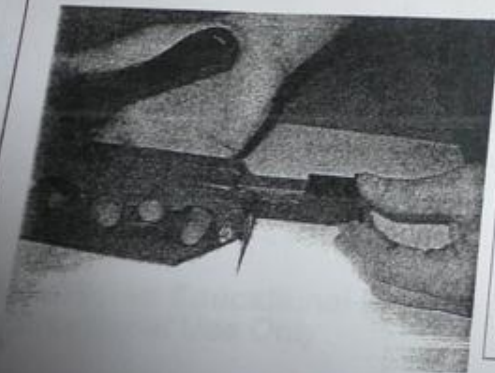
If I were able to make this product again there would be a few modifications that I feel would make the ergonomics, aesthetics and storage better. Here are some of my ideas:

- 1) I would design a storage clip that would hold the lever down so as the gun can be easily stored in a tool box.
- 2) If possible I would use a different method of joining the stapler gun together as the bolts do not make a totally satisfying look for the aesthetics.
- 3) I would put some sort of rudder around the handle to give a more comfortable and secure grip.
- 4) I would create a locking mechanism for the extra storage compartment as it just slides out when held vertical, rather than double sided tape.
- 5) I would make the mould more accurate, for a more flush and secure finish.

Testing and Evaluation



Here you can see how I have tested the hand grip and finger slots. As you can see the finger slots are of average size, and will fit most users' hands. The handle also has a curve in the shape of my hand to provide extra comfort and add to the ergonomic factor. You can also see the inside of the stapler to see how the mechanism works. As you can see it is in the closer position.



Here I am testing how the extra storage device works, and showing you how it slides in and out. It has no spring so it involves the user having to push it back in. The stapler as a whole works well and has been finished to a high standard. The mechanism functions well, and the extra storage space will hold up to 100 staples.



Here you can see me testing the mechanism on the outside, where the above picture shows how the lever cannot be activated unless the safety trigger is activated, as shown in the bottom picture.

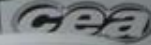
Throughout all the pictures you can see how the aluminium cover does not allow the actual stapler to come into contact with the surfaces it will be pressed against. Also how it acts as a flat surface so the user can determine where he/she is stapling.

Plan of Manufacture

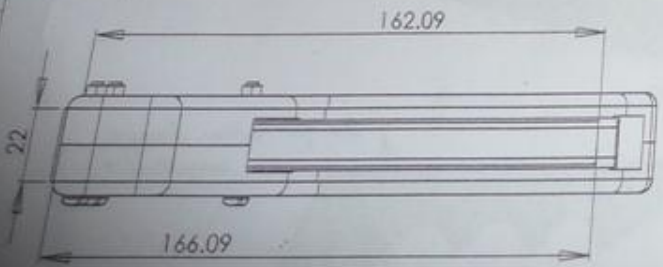
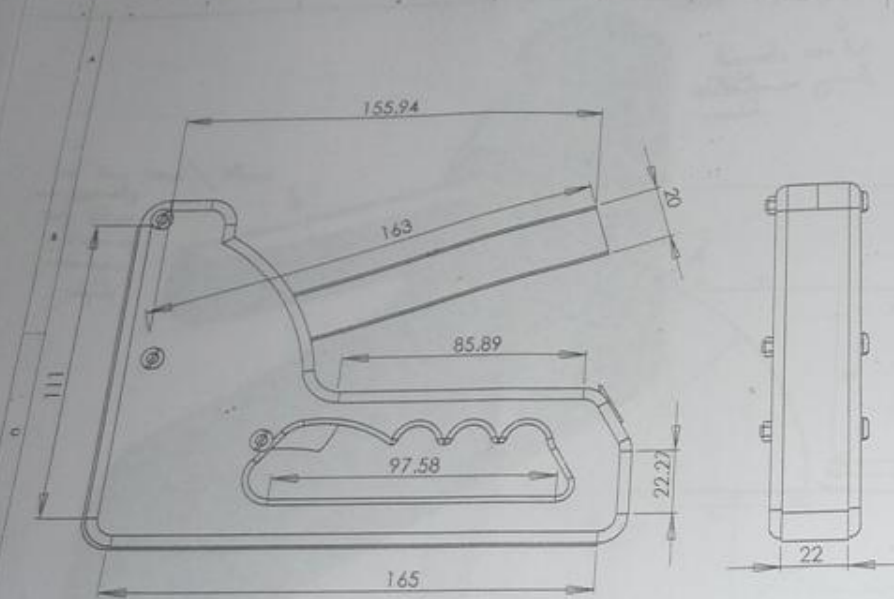
- 1) I will start by sticking two pieces of 15mm MDF together with the method of double sided tape
- 2) I will then draw the outline of the stapler gun, then with the help of the teacher cut out the shape via the ban-saw.
- 3) After I get the desire shape of the stapler cut out I will file and sand down the edges to get smooth rounded corners. the sanding will give a more smoother curving and it will have a better outcome on the vacuum former.
- 4) After I have got the desired shape for the mould I will use two screw drivers to prize them apart.
- 5) After separating them I will place them on the vacuum former to get the overall shell of the stapler gun.
- 6) After the two sides have cooled and hardened, using the gerbil I will cut them out, approx 4 - 5mm up from the surface to give an even join when sticking them together.
- 7) I will then file down the rough edges with glass paper and a light file, so the fit also perfectly together.
- 8) I will then design the safety trigger mechanism, using models and precise measurement to make sure the pivots are in the correct place.
- 9) Once I have the measurements complete I will make the hand trigger and the safety trigger with the spacing in the middle of the hand trigger to allow the stopper to move between it when the safety trigger is activated.
- 10) I will make these via the use of MDF and acrylic, where the MDF will take up the centre of the piece and the acrylic on the outside.
- 11) After these two triggers are made I will cut, file and sand them down to the desire shape and size, then finally spray them black.
- 12) Next I will move on to making the extra magazine cartage which will house the extra staples, this will involve me cutting out a hole in the back of the gun 22mm by 19mm to house the piece of MDF which will take on the shape of the extra cartridge holder which is 100mm long.
- 13) Then I will make the back cover for this, from black acrylic 25mm by 19mm.
- 14) Then for the pieces of metal which will act as supports and covers for the bottom of the stapler gun, I will make them out of aluminium. And bend them into shape.
- 15) Once this has been achieved I will file and wet and dry the metal down to get desired appeal.
- 16) Next I will decide where I will place the bolts, only two of them though as two will be used for the triggers.
- 17) Finally I will join the whole thing together and fit all the pieces of black acrylic to show where the actual staples to be

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GCE Advanced Subsidiary Examinations
CANDIDATE RECORD SHEET: Technology and Design
Summer 200_



Centre name _____



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH TO BE AS SUPPLIED
TOLERANCES:
LINEAR: ANGULAR:

NAME	SIGNATURE	DATE	SCALE	REVISION

DO NOT SCALE DRAWING

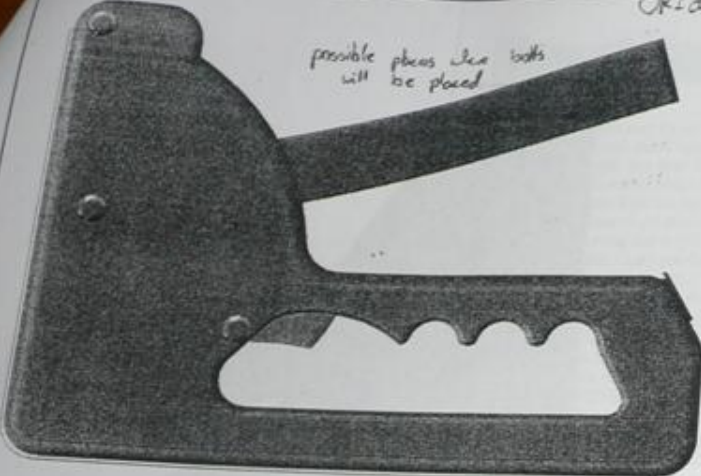
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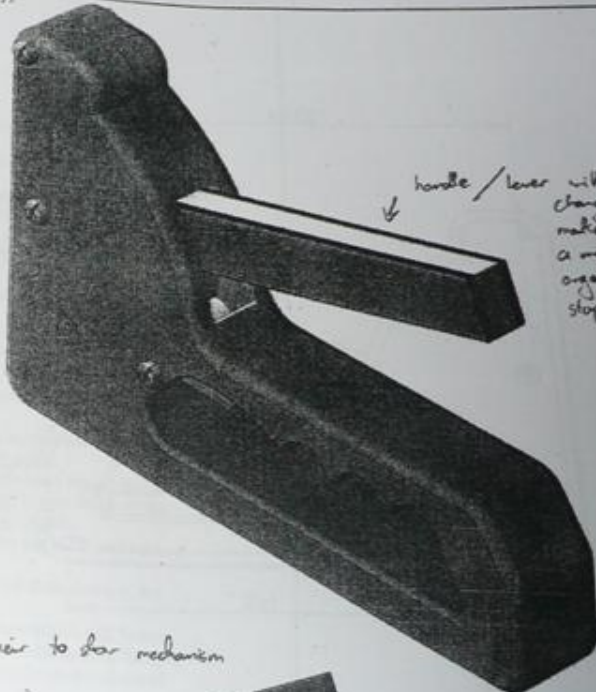
REVISION: _____

ORIGINAL FINISHED IDEA



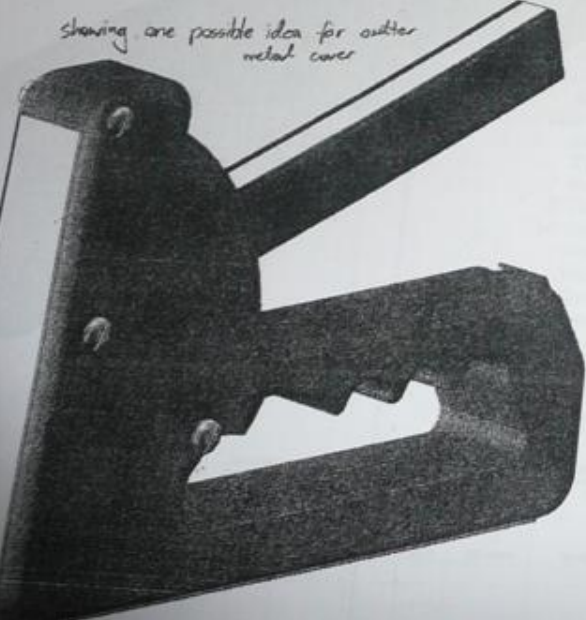
possible places where bolts will be placed

↓
but was changed during manufacture

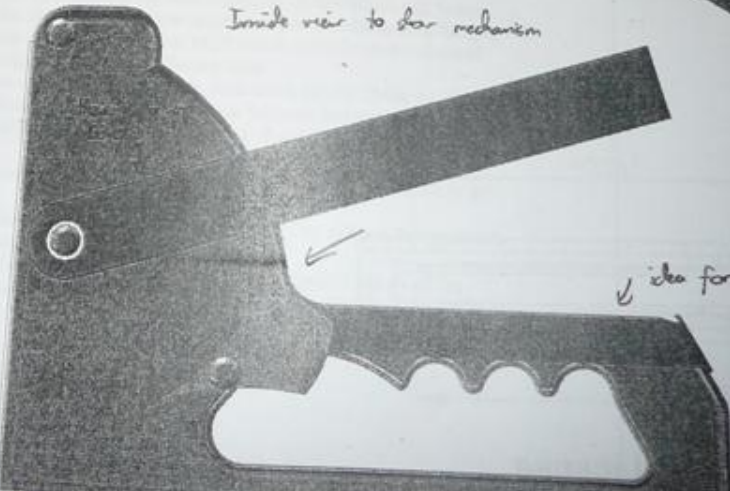


↓
handle/lever will be changed to make for a more ergonomic stopper.

showing one possible idea for outer metal cover

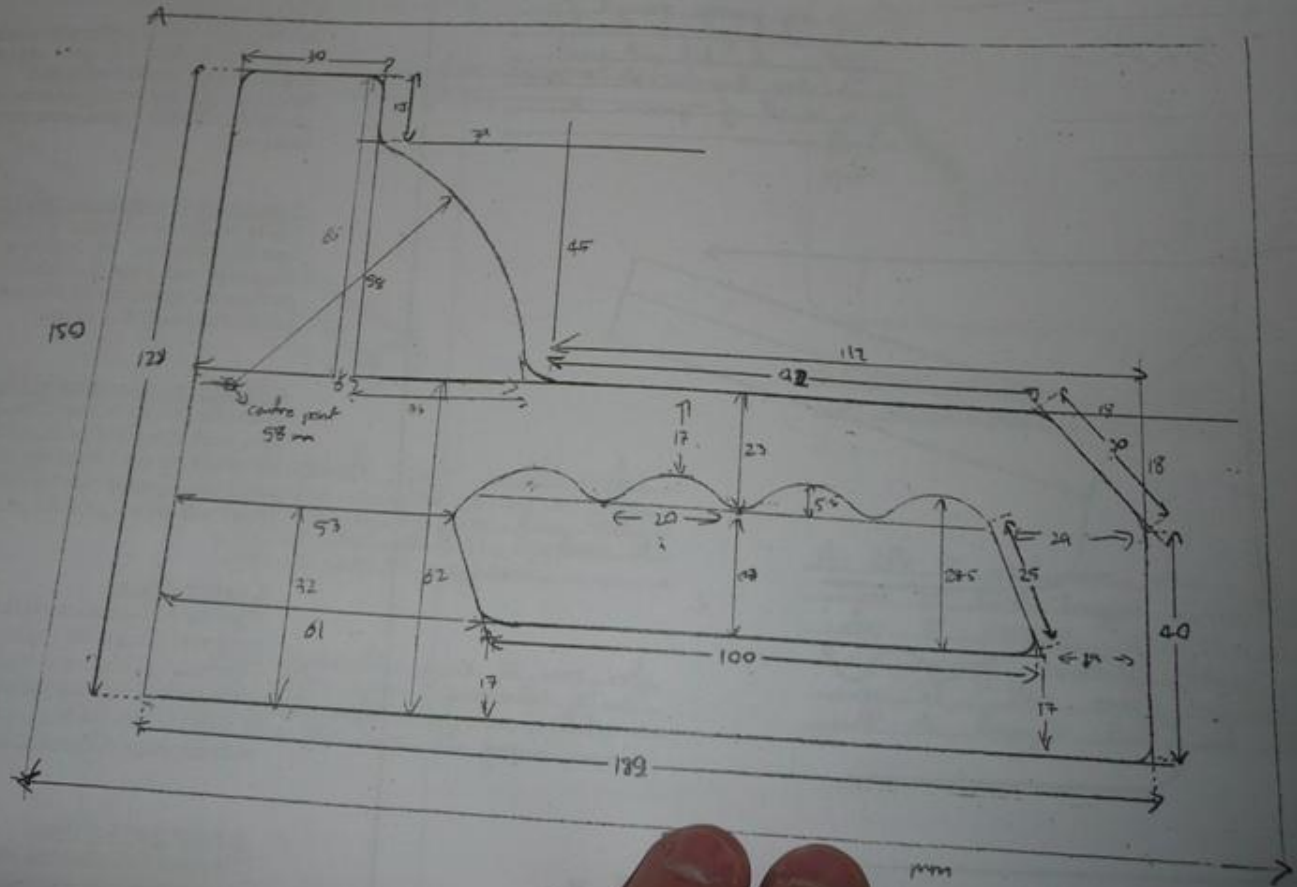


Inside view to show mechanism

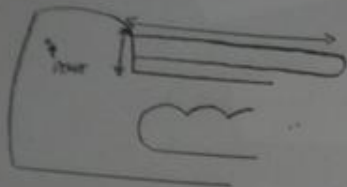


↓
idea for extra storage compartment

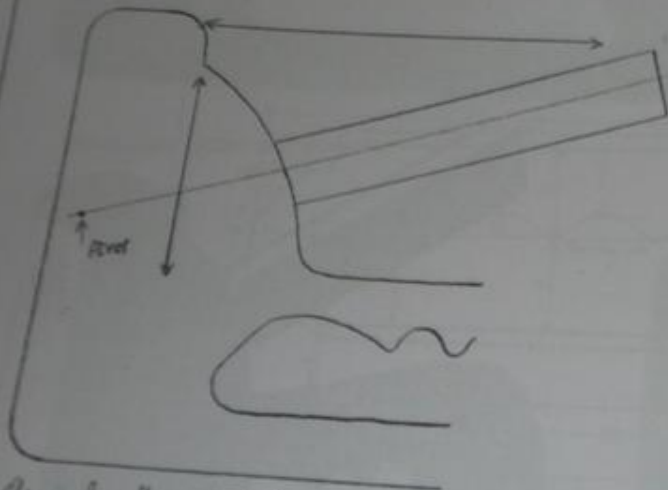
Sean Casack 135
staple gun mould.



2 IMPROVED LEVERAGE



As in an easy example of
has a deep grip is handle
which is not good
because it has a lot of space
again a lot of space to
hold



As well as the hand trigger to be activated further
up a spring for extra help, if needed this means
that less pressure will need to be applied to it
which for it to be activated thus making it more
comfortable for the user & more ergonomic
than if the hand was to be activated this would
also be the effect & a more ergonomic device

Candidate name

Candidate number

UNIVERSITY
OF
SOUTH
ALBERTA

Evaluation of ideas

1. Improvements in Handle Grip

This will dramatically improve the comfort of the stapler compared to the last one, it will also improve grip so as it will be difficult for the users hand to slip when wet. But from this I will have to consider the size of the space between each finger placement as not everyone's hands are the same size, so I will have to come up with an average.

2. Extra Maximize

This is a clever way of storing extra staples instead of the user having to carry them about in their pockets. It is a good and easy idea to make due to the fact there is a lot of space on the stapler not being used. But if I decide to put them in the same compartment where I intend to make the finger grip mod I will have to think about size, as I will not want to increase any slots for a minor mod.

3. Improved Shaped for the Hand Trigger

Due to the fact this was not a whole lot of shape to the previous hand trigger making it more ergonomic and user friendly will improve consumer satisfaction, and prevent slippage as well. I will also look at the material used to make the trigger as the previous one was made out of metal - not a very comfortable material to use, so I will consider using MDF or plastic.

4. Stability Improvement and the Ability to Stand Wear and Tear

Due to the fact the bottom of the gun has to be put through a lot of wear and tear, I have decided to consider using a metal basting to introduce extra resistance, and this intern will act as a device which will give the stapler more stability due to the flat surface - compared with the curved acrylic surface. Here I will have to consider joining methods, and take any sharp edges of the metal.

5. Safety Trigger

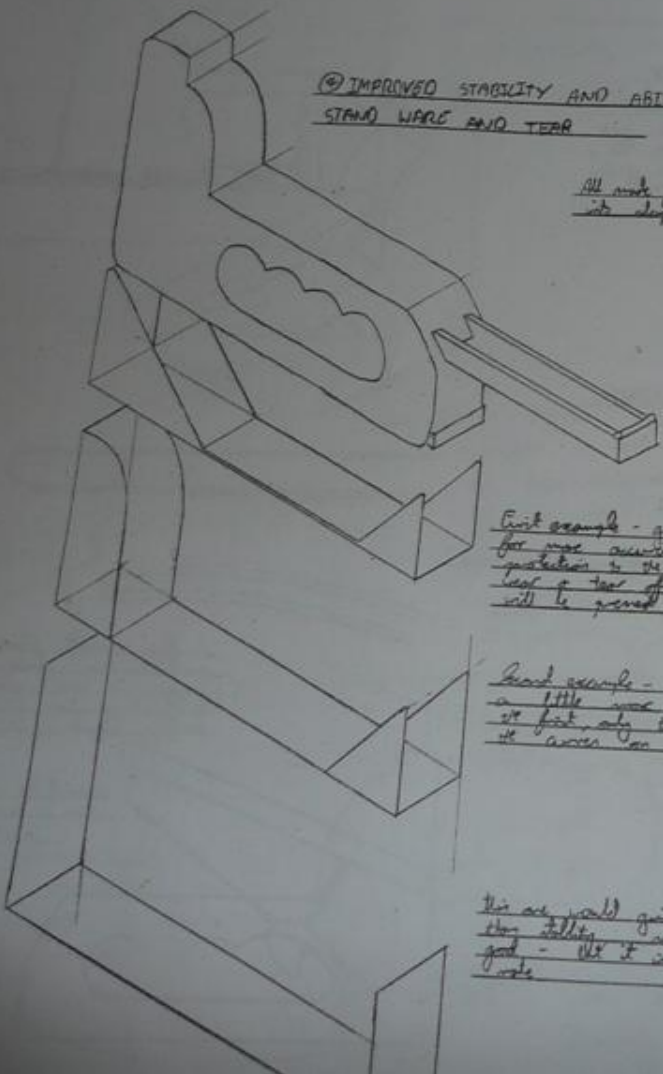
This idea will not allow children to operate the stapler and it will prevent accidental firing if the stapler was to be dropped. This idea will involve a lot of time and planning, to try and get the pieces in the right place for it to function properly. The overall design of the gun will be based around this idea if I choose to pursue it, as you will have noticed throughout my ideas page with the shape of the hand trigger, etc.

6. Improved Leverage

This idea will allow the stapler to be easily activated compared with the previous one whose wasn't leveraged that high and wasn't all that long, so by doing this I will increase the ergonomic properties and user friendliness, making it easier for the people - such as the elderly to use.

④ IMPROVED STABILITY AND ABILITY TO STAND WARE AND TEAR

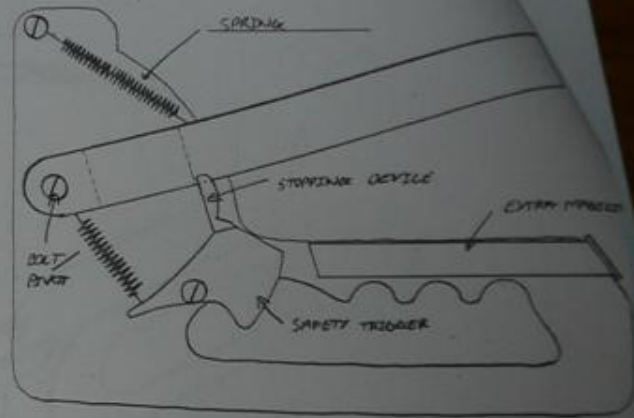
All made from aluminium & lead into design



First example - gives a flat surface for more accurate firing & gives protection to the gun from dirt, lead & tear of the surfaces it will be pressed against

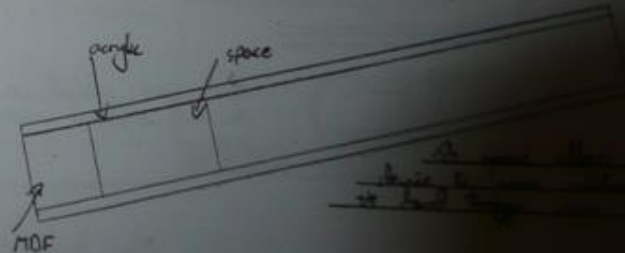
Second example - gives the same, only a little more protection than the first, only this is visible at corners on the gun

This one would give more protection than either, as it is set as good - but it is easier to make



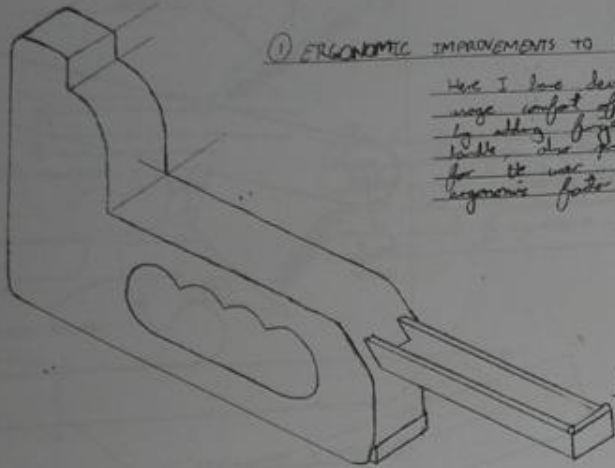
⑤ SAFETY TRIGGER - CHILD PROOFING - PREVENTION OF ACCIDENTAL ACTIVATION MECHANISM

As with the mechanism above the STOPPING DEVICE prevents the last trigger from being activated unless the SAFETY TRIGGER is pressed in first. This prevents accidental firing & children from using it, then once released the STOPPING DEVICE triggers back into their original position.

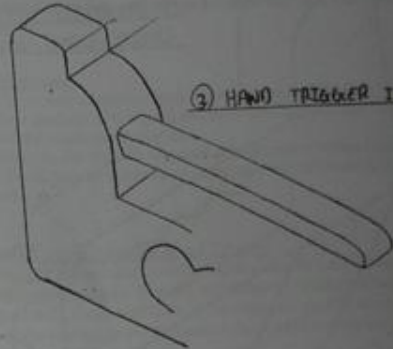


① ERGONOMIC IMPROVEMENTS TO FINGER GRIP

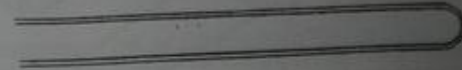
Here I have decided to improve to
 more comfort of the slope gun
 by adding a finger groove in the
 handle also providing better grip
 for the user increasing overall
 ergonomic factor



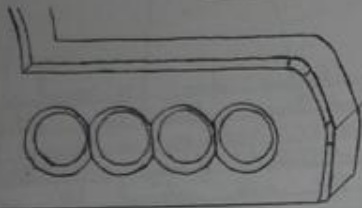
② HAND TRIGGER IMPROVEMENTS



③ EXTRA MAGAZINE



Here are a few examples



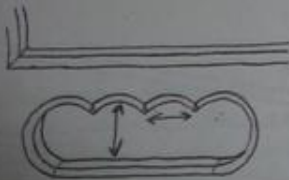
size & width will be difficult to determine!



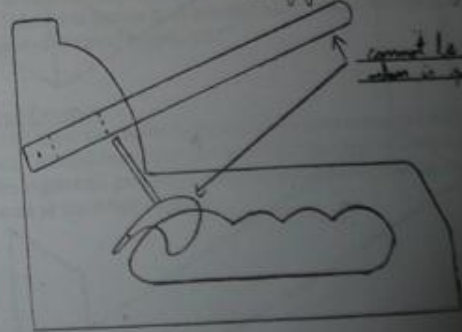
This gun is relatively straight forward
 the few holes could be drilled in the
 mould & come out any way you want
 but after research I have decided it
 would not suit all user sizes!



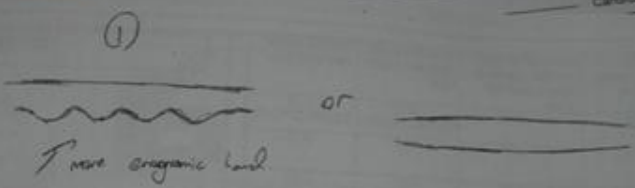
A few more ideas although I
 am thinking about a small safety
 trigger as the slope may need
 to be large as I will be using
 buffer holes



More use adaptive & can be made
 to suit different sizes of users.



cannot be drilled under
 when a special first

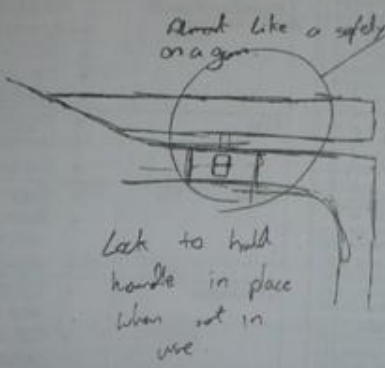
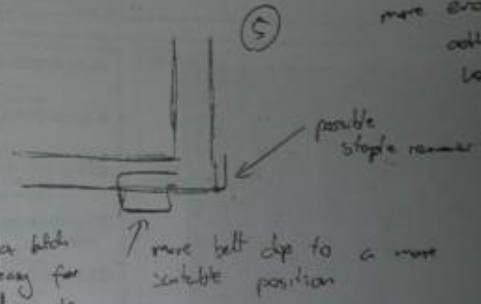
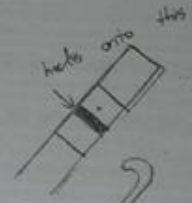
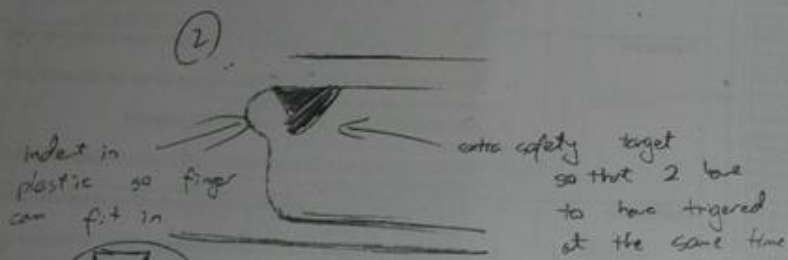


make the handle was smoother + rounder so it felt better in the hand + possibly add a rubber grip

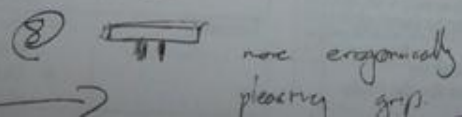
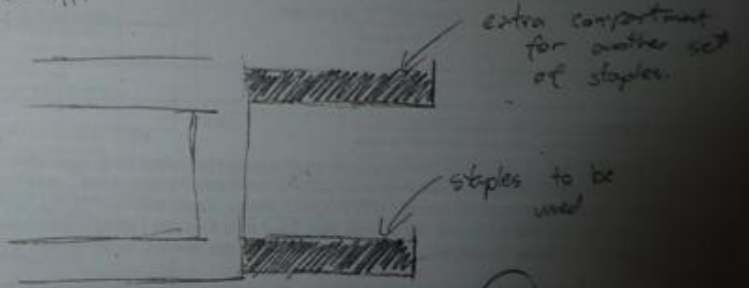


②

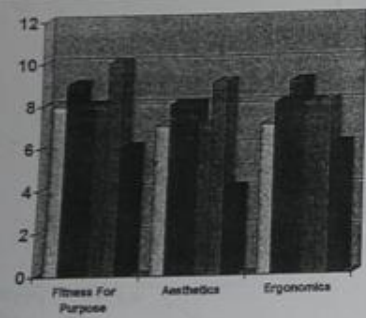
body think about overall look of the device, the shapes make the overall more ergonomic + aesthetically pleasing look etc.



More of a latch makes easy for children to take off.



AREA	Clarke CEN120 Electric Staple and Nail Gun	Arrow CT50K 10.8v Li-Ion Staple Gun Kit	PRO140EL Electric Stapler and Nailer (230v)	Tacwise 'Ranger 40 Duo' Cordless Staple and Nail Gun	Z3-140P Hand Tacker/ Nailer Kit	CSG10 Staple and Nail Gun
Fitness For Purpose	8/10	9/10	8/10	8/10	10/10	6/10
Aesthetics	7/10	8/10	8/10	7/10	9/10	4/10
Ergonomics	7/10	8/10	9/10	8/10	8/10	6/10
Maintenance	5/10	6/10	7/10	6/10	8/10	6/10
Materials and Production Methods	8/10	9/10	7/10	8/10	8/10	8/10
Cost	7/10	7/10	3/10	7/10	9/10	9/10
Safety	9/10	5/10	5/10	8/10	7/10	5/10
Durability	7/10	7/10	6/10	7/10	7/10	8/10
Total	58/80	58/80	52/80	59/80	66/80	52/80




- Clarke CEN120 Electric Staple and Nail Gun
- Arrow CT50K 10.8v Li-Ion Staple Gun Kit
- PRO140EL Electric Stapler and Nailer (230v)
- Tacwise 'Ranger 40 Duo' Cordless Staple and Nail Gun
- Z3-140P Hand Tacker/Nailer Kit
- CSG10 Staple and Nail Gun


Conclusion

The information that I have collected throughout my analysis section has helped me to choose the product that I am going to develop and modify. The figures on the comparison table show two possible options that I could have chosen due to there low suitability. CSG10 Staple and Nail Gun and the PRO140EL Electric Stapler and Nailer (230v), however this does not necessarily mean that I should choose one of these ones. The 3 main areas that I intend to modify are the safety area, ergonomics and the fitness for purpose. The score that each stapler gun received, via my opinion, is portrayed in the bar chart above.

The chart shows that the CSG10 Staple and Nail Gun was the lowest in all the areas that I plan to modify and that the PRO140EL Electric Stapler and Nailer was relatively higher in these areas, thus so making my decision for that that the stapler gun I will be redesigning and modify is the CSG10 Staple and Nail Gun.

	Specification
Function	<ul style="list-style-type: none"> The new redesign stapler should ensure that a child is unable to use it and that accidental activation is prevented. It must have a storage compartment for extra staples. It must have a superior hand grip to the last version. The part of the gun that comes in contact with the various surfaces must be able to withstand the wear and tear. The leverage of the gun must be better than the previous gun.
Fitness for purpose	<ul style="list-style-type: none"> The stapler should have enough force to penetrate a range of materials. The gun should look aesthetically pleasing. It should be comfortable to use. It should be able to take a range of different staples.
Aesthetics	<ul style="list-style-type: none"> The stapler should have a curved, comfortable look. The outer casing should have the company logo for a more professional look. The staplers colour should be eye catching to attract customers attention, and so it can be easily spotted on the building site.
Ergonomics	<ul style="list-style-type: none"> The prototype should be lightweight and comfortable to use over long periods of time. The lever and the safety trigger must be easy to use for and adult, and easy to understand how it operates. New staples must be easy to load into the magazine. It must be quite in operation. The new gripping must be comfortable to use and a variety of hand sizes must be able to use it.
Maintenance	<ul style="list-style-type: none"> There must be no holes, cracks or crevices for dirty to get into, all the joints must be sealed. If necessary the gun must be able to be taken apart, in the case the mechanism breaks.
Materials and Production Methods	<ul style="list-style-type: none"> The materials used must be strong, resistant to impact and resistant to corrosion. A range of materials should be employed when making the project. The materials should be easily cleaned and maintained. The manufacturing process should have minimal wastage. Materials should be suitable for mass production.
Cost	<ul style="list-style-type: none"> The overall cost of the stapler should be under £12.00. Product should be suitable for mass production to increase profit. Standardisation should be used where possible.
Safety	<ul style="list-style-type: none"> There must be a method that prevents the users hand from slipping. There must be a method that prevents accidental activation and children for using it. There should be no sharp edges.
Dimensions	<ul style="list-style-type: none"> The total width of the gun should be no more than 75mm to ensure most varieties of hand sizes can fit around it. The overall length should be no more than 185mm for average purposes.
Durability	<ul style="list-style-type: none"> The outer materials should be durable enough to withstand impact and scratching. The inner workings must be reliable enough to work for long periods of time without breaking.
Time	<ul style="list-style-type: none"> The project must be completed March 15th

	Tacwise 'Ranger 40 Duo' Cordless Staple & Nail Gun	
Abstract		Notes
Fit for purpose	This staple gun is very fit for its purpose due to the fact it can be used to staple almost all woods and, as it is a heavy duty staple. The fact this also adds weight so it can strain the arms over a period of time. It can hold at one time up to 1000 staples, and the battery lasts for 3 hours of constant use. It is a multi-functioning gun as it has the ability to fire out nails as well as staples.	6/10
Aesthetics	The overall shape of the staple gun is aesthetically pleasing and functional. The orange colour of the gun is very eye catching and appealing to consumers. The overall shape of the shell is quite aesthetically appealing, all these characteristics make it stand out.	7/10
Ergonomics	The shell of the gun is made out of ABS a hardened plastic that is molled down then dried to form the shape. There is no rubber grip or indent on the handle so it is difficult to hold with wet hands. The weight of the device is 2.3kg so it is quite heavy and uncomfortable to hold for long periods of time, but there is a trigger system to lessen the recoil when the device is fired. The gun can be taken apart but before the user is skilled at repairing pneumatic and gas operated components there is little help. The magazine is easily detached via pressing the release button as is the compartment for storing the gas cylinders. Easy to piece as it comes with a case, where all components can be placed.	6/10
Maintenance	The overall shell can be taken apart via a screw driver, the body is splash resistant and stain resistant. It can be easily cleaned, but dirt (concrete - saw dust) can get trapped in the small section not out to supply to lower circuitry with fresh air. Also the user would have to be skilled in pneumatic and gas operated components to repair the device. But the device comes with a 2 year guarantee.	6/10
Materials and production methods	The 1 side of the gun are made via injection moulding from ABS plastic, which reduces waste and can be used as a mass production method. ABS is a tough material which is needed for the conditions on the building site this gun will go through. The aluminium magazines are made via die casting, give them the complex mould they have and paint to give a good shiny finish.	6/10
Cost	The cost of this staple gun is £177.98. The cost per pack of staples is £2.49 and nails - depends on lengths. Overall due to the high quality of the device, it is worth the price which it is being charged, as it comes with 2 battery packs and a heavy duty motor case, and it is hard to break. The fact it fires nails and staples means you are getting 2 in the 1 at a good bargain.	7/10
Safety	The gun comes with a double trigger system which means it cannot be fired unless it has a flat on the surface of another and the trigger is pressed. There is also a locking mechanism which when activated the device cannot be used.	6/10
Durability	Because the shell is hollow inside if dropped the circuitry can be broken about, but it is tightly held in place so only if dropped from an extreme high cost it be damage, also the ABS is quite tough protecting structure etc.	7/10

	Z3-140P Hand Tacker / Nailer Kit	
Abstract		Notes
Fit for purpose	This is a small heavy duty hand staple gun used by professionals due to its small size, and because it is easy to transport. It can use 2 different types of staples, and the hand trigger locks down for provide easy storage. The small turn button on the side acts as a depth gauge allowing the device to be operated on with different densities of materials. The gun has a belt clip attached to the tradesman can clip it onto his belt. It also has a small gap on its side so the user can use if replacement staples are needed.	10/10
Aesthetics	The staple gun surfaces are all smoothed out and all the edges are rounded to give a nice streamlined appearance. The bright orange colour makes it eye catching and easy to see on a building site. It comes in a range of colours adding to its aesthetic value, and each separate colour on the device is a contrasting colour to make it obvious and stand out, adding to its aesthetic characteristics. The company's logo (TACWISE) is moulded onto its side adding further to its aesthetically pleasing abilities.	6/10
Ergonomics	The handling of the gun is comfortable due to the smooth surfaces and curved edges on the device, as there are no sharp corners or edges. The hand trigger is moulded in the shape of a human palm to provide optimum comfort when the user is pressing it down back. Staples are easy to replace due to the pop-out and set in device. All the small components on the device have small pictures printed on them to show what they are use for, creating a high user friendly level. The device is small and compact for easy storage and transportation - making it very user friendly.	6/10
Maintenance	Because there is not many holes or small features dirt can get into the cleaning of this device is relatively easy. The device cannot be taken apart so for maintenance it will have to be sent back to the manufacturer, but due to the high quality nature of the device little should occur, if even occur.	6/10
Materials and production methods	The staple gun has been made from the injection forming process to give an accurate profile of the small complex design also giving the maximum strength, as the process is a profitable as possible. It is made from ABS a very tough plastic, so it can withstand the wear and tear of the average building site, it can also withstand heavy usage as the mono-directional guarantee it will last for more than 3 years. The small piece of aluminium at the front is made via die casting as it is a process which can be mass produced. The overall set up of injection moulding and die casting has high initial costs but if the product is successful it will pay itself off over time.	6/10
Cost	The cost of the staple gun is £119.54. And the cost of replacement staple is £1.98, making this particular staple gun very good value for money due to the given guarantee of the time it will last and the relative cheapness of replacement staples.	6/10
Safety	All the edges and corners are smoothed and curved so no injury can be gotten in this form. There is also a locking mechanism to lock the handle in place when not in use, and the hand trigger is hard to activate as a child would be unable to do so.	7/10
Durability	The device is relatively small so the outer body holds the inner components tight, so when its dropped they are not dislodged. The tough ABS is splash resistant and the overall device is waterproof as there is no circuitry. The ABS can withstand most cracking forces but on a building site if something heavy is dropped on it, it will crack.	7/10

	CSG10 Staple & Nail Gun	
Abstract		Notes
Fit for purpose	This staple gun is an effective device for staple a range of materials together. It can hold 3 different types and sizes of staples so it could be said to be a multi-functional device. Its body is extremely durable and it is water resistant so it fits its primary function quite well, and it has a safety device which doesn't allow it to be fired unless released, but it is easy to activate. Overall it fulfils its primary functions well but has a limited range of additional features.	6/10
Aesthetics	The overall shape of the device is functional, with little aesthetically pleasing value, although the manufacturer has tried to make it more aesthetically pleasing via the contrasting colours, on the front and on the inside of the handle.	6/10
Ergonomics	The body of the device is aluminium which can be difficult to grip and handle, especially with wet hands. The handle is just made from smooth aluminium to give a more comfortable handling but once again it is not used to one with wet hands. Because aluminium is lightweight, this provides comfort when using the device for extended periods of time. The device is relatively compact as the hand trigger can be held flat in place to make the easy storage. The compartment which holds the staple is very easy to open and replace, so it is a push or pull down mechanism which saves time and effort.	6/10
Maintenance	Because the body is made from aluminium it is not liable to rusting as it is easily cleaned via the use of water. The device is easy to take apart so maintenance can take place inside as well as outside, to insure all the mechanisms are functioning properly. But because the inner workings are small and complex maintenance can be a time consuming process and a regular use of dirt gets lodged in the inner parts.	6/10
Materials and production methods	The shell of the staple gun is made from the cast aluminium which is an advantage as it can be mass produced, also complex shapes and shapes can be added into the mould. The inside are very complex and cannot be made from the same process and have to be made via a casting process. The inner mechanisms is based on this, where a spring is tightly held in place, then released to move out the staple with great force. All these processes are intricate as they mean all parts of the staple gun can be mass produced. These materials are very durable so the finished staple gun is durable and chemicals is not prone to rusting.	6/10
Cost	The cost of the staple gun is £8.98. Replacement staples range from £1.98 - £1.29 and depending on the size of the pack, the number of staples varies. The overall cost of the gun has been kept to a minimum so that mass produced and all components are manufactured. Due to the durability of the device, meaning it will be long-lasting, and its relative low cost means this is a good value for the money purchase.	6/10
Safety	The main safety feature is the locking mechanism which is an accidental firing of the device and prevents children from using it. It is easy to remove and forget about, this prevents the device from being used.	6/10
Durability	The gun die cast body, even if it is lighter weight than other materials it will be put through.	6/10

Section 2: Analysis

Image	Product Name	Score
	Clarke CESN120 Electric Staple & Nail Gun (230v)	
Design for success	Analysis This staple gun is an effective product for its purpose, it can shoot nails through different materials with different densities and the magazine can be easily changed and reloaded. It is quite durable due to the hardened plastic around it so it will not break easily if dropped. It is easily stored so it can be transported easily.	8/10
Aesthetics	The shape of the gun is functional, the yellow colour is aesthetically appealing and eye catching. It has a smooth body shape with no points or jagged edges and the stamped logo on the eye background stands out for more appealing characteristics.	7/10
Ergonomics	The overall main body is made out of ABS a hard and durable plastic with additional rubber hand grips for extra comfort, and it is only 2.1kg so most of the ergonomic necessities are met, such as not being too heavy to hold for extended periods of time. (relatively lightweight for its size) The magazine comes off with relative ease for a mature adult as it is child proof, and is easy to reattach. It comes with a storage hook so the gun and magazine cartridges are easily stored away.	7/10
Maintenance	The staple gun is glued together and there are no fixtures such as screws to take apart and reassemble, so if repairs are needed the user cannot fix it, so it would have to be sent back to the manufacturer if a fault were to occur. But due to the overall quality of the device maintenance is rarely needed - as stated by the manufacturer.	5/10
Materials and production methods	The outer casing of the staple gun is made out of ABS, a hardened, strong, durable and resistant plastic - made via the method of injection moulding to get the complex and smooth shapes involved in the staple gun. This leaves a relatively large area with which to house the circuit which operates the gun. The magazine is made from die cast aluminium, so complex shapes can be produced, this also is a durable, strong material so it can resist scoring from the heavy usage. Finally the front of the gun where the staples are fired from, is made from a hardened stainless steel and coated with a surface paint. This part is made from stainless steel as it has to resist a lot of wear and tear due to the fact this is the only point in the product which will come into contact with the materials intended to be stapled. All of these materials can be mass produced decreasing the cost per unit manufacturer.	8/10
	The cost of the gun is - £63.89 The cost of staples for the device is £1.89 per packet. The cost for the electric is of average price and has been kept this way because the capability of mass producing its components, and due to its heavy usage and the cheap cost of staples it is a good value for money buy, also due to the 2 year warranty.	7/10
	Because the front of the gun has to be pressed up tight against the surface of the intended material to be stapled, the gun cannot be fired. Because when the front is pressed tightly up against a surface it activates a trigger allowing the gun to be fired creating a high safety factor. Also the hand guard where the magazines is held also acts as a barrier if the gun were to slip, thus the users hand would not be injured.	9/10
	The hardened ABS and the cast body allow for a resistant surface. They also act as shock absorbers to prevent the inner circuitry from being damaged, thus being very durable and resistant to impact.	7/10



Image	Product Name	Score
	Arrow CT50K 10.8v Li-Ion Cordless Staple Gun Kit	
Design for success	Analysis This staple is almost perfectly suited for its purpose, it is small and compact in its easy to transport. It is very lightweight so it doesn't stress the users hand and if it is dropped it is unlikely to break or fracture due to the hardened ABS it is made from. It also has a depth gauge so you can choose how hard the staple is fired from the gun, allowing it to be used for a wide range of materials. It is battery powered which lasts long periods of time, fires up to 2000 staples with one charge, and the staples are easily replaced in the magazine. It also has an LED placed on the front so the user can see where they are stapling in small dark hard to get at places.	8/10
Aesthetics	The gun has three main colours red, black and grey which makes it stand out, and the company logo is moulded onto the shell also quite aesthetically pleasing. The smooth shape and feel of the gun also make it quite attractive to customers, but it catches the consumers eye via the contrasting colours.	8/10
Ergonomics	The handle is relatively slim so it is easy for easy use, even ones with smaller hands, to grip and hold firmly. Also because it is made from rubber the user hand is less likely to slip. The trigger is placed just where your index finger goes and is easy to press and comfortable to use. The gun can be used via left handed or right handed users as it is perfectly symmetrical, it is also very lightweight so it can be used for extended periods of time. Staples are easily replaced by opening the red slot at the back, which is also very noticeable due to its colour.	8/10
Maintenance	The gun is fired together via glue and there are no fixtures or fittings such as screws, to show signs that it can be taken apart so if repairs are needed the owner of the device cannot conduct these, it has to be returned to the manufacturer. However the overall quality of the product means it has a low breaking risk.	6/10
Materials and production methods	All the materials on the device (the handle, trigger, depth gauge, battery holder and staple holder) have all been made via injection moulding from ABS plastic. This is a relatively cheap process involving none the initial capital cost is recovered, so it pays for itself over a period of time, due to the fact there is no waste and the gun can be mass produced. The overall shell has shock absorbers house around the inside layer of the shell so if the device were to be dropped in circuitry is not damaged. The circuitry is made via PCB board the printing the correct set up onto it etc.	9/10
Cost	The cost of the staple gun is £67.98 Replacement staples for the gun are priced at £1.97 per pack. The gun is quite expensive but due to the quality it can be priced this high so the company can cover the costs of the initial capital costs and make a profit. This product is a average value for money as the user is guaranteed high quality and it comes with a 2 year warranty.	7/10
Safety	The device has a safety button which has to be deactivated before the device can be used. But if left open the gun is easy for children to use and cause serious harm.	5/10
Durability	This staple gun is quite durable as it will avoid cracking if dropped from small heights and the shock absorbers will add to this prevention.	7/10



Image	Product Name	Score
	PRO140EL Electric Stapler & Nailer (230v)	
Design for success	Analysis This staple gun is quite fit for its purpose, it is small and compact thus being easy to store a transport. It can house two different types of staples allowing for a wider range of depths which it can penetrate, in fact widening the range of materials it can be used for. It has a clip on the back so a professional tradesman can hook it onto their belt for easy transportation. The battery can last up to 2 of constant usage so there is no need to constantly recharge it.	8/10
Aesthetics	Overall the device is quite appealing due to the contrasting colours and the curved, smooth shape. The contrasting colours make it eye catching to consumers, and the company logo moulded onto the shell also makes for an aesthetically pleasing feature. The grip moulded on the hand which leads on up to the part which houses the mechanism also makes for an aesthetically pleasing part.	8/10
Ergonomics	The gun edges are all smoothed out making it more comfortable to use and handle. The rubber grip allows for a more secure hold along with the indent on the rubber preventing slippage, which all add up for a more comfortable hold. The gun is perfectly symmetrical, allowing the use of right handed and left handed users. To operate the device the safety has to be turned off and then the user pulls the trigger which is very easy to operate as there is not much force needed to do so. Finally it has a double buffer system installed which will add for improved comfort as it will absorb any small shock once the gun is fired.	8/10
Maintenance	The device is fired together and cannot be taken apart by the user, if a fault occurs it has to be sent back to the manufacturer for repairs, but it has a 3 year warranty. But the quality section in the manual states that it is a high quality device and is very unlikely to break.	7/10
Materials and production methods	The process used to make this gun is injection moulding as it can make the complex shape used in the design of the device, using ABS plastic because it is easily melted into shape and produces a hard protective, resistant shell when fired. This process is expensive to start up as it involves high initial costs but after time, because this process is used to mass produce products, it will pay itself off. The small clip attached to the back, for tradesmen to attach to their belts is made from stainless steel, as it is only a small part.	7/10
Cost	The cost of the gun is £67.99 Cost for replacement staples is £1.98 and £4.45, depending on which the user requires. Overall it is good value for money due to the fact there is a three year guarantee and replacement staples are relatively cheap.	8/10
Safety	The main safety feature on the gun is that it has a safety lock, but this can easily be forgotten to be activated and if a small child were to get hold of it, it could cause serious injury.	5/10
Durability	The gun is quite durable as it will avoid cracking if dropped from small heights and it is splash resistant.	7/10

Centre name: _____ Centre number: 71

Section 1: Introduction of Intended Product

Clarke CESN 20 Electric Staple & Nail Gun (230v)

The main purpose of this product is to be able to drive a staple or nail through an intended piece of material to firmly hold it in place with constant, consistent force. It is intended to be used with all types of timber and manufacturing board. It is not intended for the basic everyday user such as a teacher stapling a poster to a board wall, as it is a heavy duty stapler, it would be best suited and is intended to be used by the people in the professional trade.

It weighs 2.1kg - not very light, more evident that it is for industrial use. As it is a stapler/nail gun, it holds staples and nails. It can hold a variety of nails and staples, to suit the different situations it is used in.

The spring safety probe does not allow the stapler to be activated unless it is pressed tight against the surface it is going to be fired at.

This prevents children from using it, and accidental firing.

It has a very smooth outer casing with no points or sharp edges - adding to the ergonomic and aesthetic properties.

The bright yellow is very eye catching and makes it easily spotted on the building site.

The main shell of the gun has been injection moulded from ABS due to the complex shape of the body which is also a very cost effective process. The magazine is made from stainless steel, via the process of die casting, as it is not a very complex shape and it needs to be strong and durable as it will be shifted and moved about a lot and possibly dropped from time to time - so it needs to be able to withstand wear and use.

The cost of the staple gun is £63.89, with the average price for a packet of staples being £1.89 per pack.



Tacwise 'Ranger 40 Duo' Cordless Staple & Nail Gun

This product is a heavy duty staple gun used by professional tradesmen to nail or staple dense heavy materials to others within a frame to be able to easily penetrate the materials.

It is cordless and it can be used anywhere and has two battery packs so one can be in use while the other charges.

It is cordless and it can be used anywhere and has two battery packs so one can be in use while the other charges.

It's ideal for many fixing and fastening jobs such as door frames & skirting, heading & molding, fixing roofing sheets etc. It is intended however for small tedious tasks due to its powerful nature.

Because of its weight it must be comfortable for the user to hold for long periods of time and must be sweat resistant so it does not slip out of the users hand while in use, weight - 4.5kg.

There is a number of magazines that are easily refilled so the user can get back to work as soon as possible and waste little time, they also are easily installed back into the device.

The safety precaution prevents the user from firing the gun unless the spring action device is pressed against a surface.

The batteries last a relatively decent period of time to let the tradesmen's work continue with little time wasted, they are easy to remove and replace back into the device.

Due to the complex shapes of the gun it has been injection moulded from ABS and then each face joint together via screws so it can be easily repaired etc. The components such as the belt attach, the battery and the magazine will all be standardised so the customer can replace them without high costs to them and the manufacturer.

The outer casing is also splash resistant.

The manufacturer has used rigid polystyrene and stainless steel because of the cost effectiveness of the materials, although having to form the staff would be the disadvantage of using the injection mould process.

It costs £137.98, with each cartridge of staples averaging around £2.49.

Arrow CTS0K 10.8v Li-Ion Cordless Staple Gun Kit

The main purpose for this particular product is to staple materials to others, within the relative density. The gun allows the staple to be fired into a particular material, for example it can be used for various DIY purposes and stapling upholstery onto objects - like carpet or insulation fitting, securing vapor barrier or plasterers metal lath etc.

This staple gun can be used by every tradesman, DIY enthusiasts and your everyday hobby user and teachers stapling posters to walls etc.

There is a depth control gauge which allows the user to decide how much force he/she wants the staple to be shot out at - depending on the relative density of the material it is being shot into.

There should be a safety switch, to prevent accidental activation, and as a child prevention device.

The battery should last for long periods of time - it can shoot out 2000 staples on a fully charged battery.

The product should be lightweight so it can be used for long periods of time. Also the device should be comfortable to use, so the user should have some sort of comfort factor to improve ergonomics.

A small LED should have a lot of light produced so the user can see what they are doing.

The battery should be easily replaced.

The main shell should be made from injection moulded ABS due to the complex shape, and the manufacturer should try to make it a cost effective process and make it as cheap as possible, so possibly made out of a rigid polystyrene plastic. It should be strong and durable due to the heavy usage it will go through. The materials used such as the plastic and stainless steel used need to be cost and light weight.

It costs £67.98, and the average cost per pack of replacement staples is £1.97.

It should come with some sort of warranty, in case it breaks.



Z3-140P Hand Tacker / Nailer Kit

The intended purpose of this particular 'manual' staple gun is to be lightweight and easily carried about and transported.

It is intended to staple materials together to have a firm and secure hold, but at the same time not to have too much force whereas it would damage the materials.

It is not an automatic staple gun so it will not shoot out as many staples per minute as the previous guns I have examined.

It is meant for the professional user, home owner or DIY hobbyist, for all the basic staple gun uses.

It weighs 1.5kg - so it is light and easy to use for long periods of time.

There is a locking device which allows the handle to be locked down in place, to allow for easy storing.

There is a belt clip which allows the tradesman to hook it on to his belt, rather than leaving it behind or having to carry it about.

The orange colour adds to aesthetics and allows it to be easily spotted.

The overall shape is very smooth and curved, adding to comfort factor for the users etc.

Hardened plastic shell allows for a shatter proof device and splash proof.

The manufacturing technique used in this case is split moulding where 'TACWISE' would produce the two faces then join them together via screws so the faces can be taken apart and repairs can be made if necessary.

The smaller parts of the device would clearly have to be injection moulded due to their size.

It costs £19.54, with replacement staples averaging out at £1.98 per pack.

pro4EL Electric Stapler & Nailer (230v)

The main purpose for this pro4EL is to easily staple materials together for the everyday user, such as fastening furniture and other items. This staple gun is intended for the tradesmen and your basic everyday user due to the small compact size of it and its weight.

It should be light weight and ergonomic to hold so the user can experience comfort as well as reliability, this is due to the ergonomic design of the handle which will recoil to absorb any shock caused by the firing of the device, furthermore the handle will be reinforced with a rubber material to reinforce the ergonomic factor.

It should have a safety switch between staples and nails, the magazines can hold 100 staples.

It should be able to hold different sizes of staples.

It should last for a long time of use.

It should be easy for tradesmen to attach to their work belt due to the fact it has a belt hook 0.8kg.

It should have a good grip and ergonomic properties, and the overall shape is very curvy and this improves the ergonomics as well as the aesthetic factor.



CSG10 Staple & Nail Gun

It is intended to give a good strong hold, and not be easy to take apart. It can hold 4 - 14mm, 10 - 12mm and 10 - 14mm staples.

This staple gun is intended for heavy duty use and therefore is mainly used by professional tradesmen and DIY enthusiasts.

The outer casing of the staple gun is made of a durable material as it will be used on building sites where the terrain is rough, so it must withstand a lot of wear and tear. T

The gun should be able to withstand occurrences such as falling onto hard surfaces from steep heights, so this is a likely occurrence on the building site. T

The staple gun should have a long life and last for a number of years in these rough conditions on the building site.

All corners and edges are rounded to make it comfortable to carry around and transport.

The staples should be easy to replace once the current set has run out, and the hand trigger should have a safety lock so it does not fire accidentally or so a child cannot activate it.

The casing is made from aluminium as it is a very durable material. The inside of the shell has a very complex shape which helps to house the mechanism which fires the staples.



Criteria	Maximum mark	Mark awarded	Page No.
Product analysis	20	17	

Evaluation

My product itself was a very satisfactory outcome; it met most requirements set by the specification. However, if I had the opportunity to remake the product again. There would be some changes that I would probably make:

Further Modifications

➤ Although I decided not to when I was making the product, I think now, that if I were to make it again, I would probably try to include the second spirit level, it would go on top, and would be viewable from top and from sides, it would lie horizontally, and the round spirit level would lie vertically.



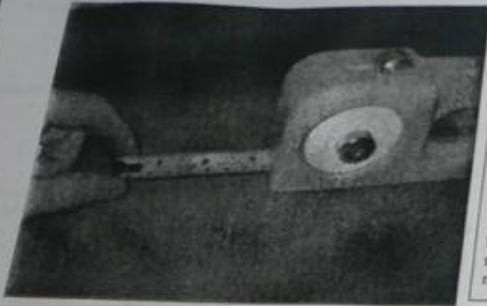
➤ Another improvement would be to try to recess the larger pin, into the white circular section, this would make it flush with the surface and I think it would also improve the aesthetics of the product.



➤ Another further improvement that I could make, would be to make the nuts for the pins using the lathe, this would provide a far higher quality of finish, and improve the overall aesthetics.

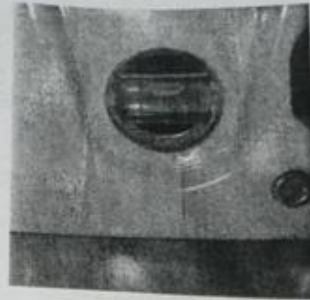


Testing



The measuring tape is very useful. I haven't changed the tape design that much from the original, however one problem would be that the hole for the tape to fit into is slightly higher than the surface, therefore this will have to be considered when measuring.

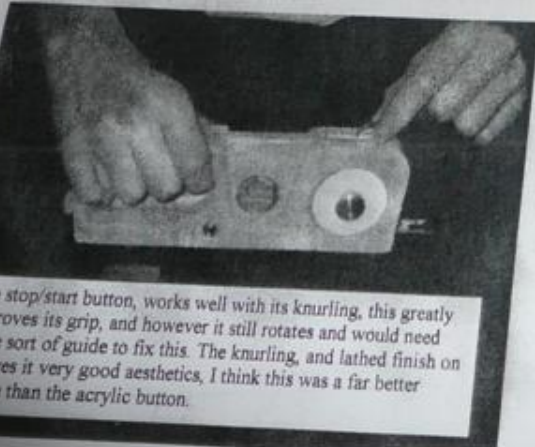
The laser design looked very well with the knurled section on the end, the nylon insert and the cut angular section also look well. One problem would be that the laser can take up some of the finger room in the grip, but normally it's not very noticeable.



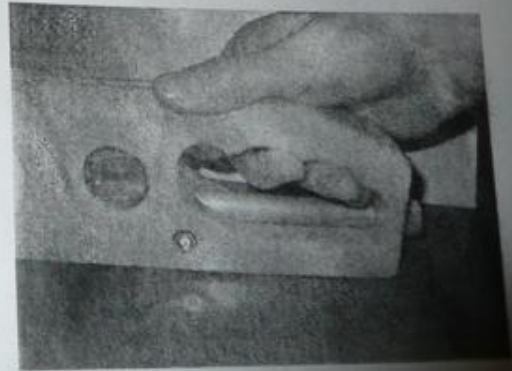
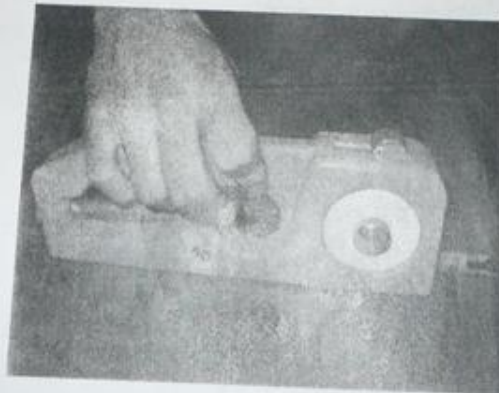
The spirit level, turned out to be very successful. It works. It also, improves the aesthetics of the product, as it sits in nicely into the 'v' section of the product. I also think it improves the colour scheme of the product. Perhaps having two spirit levels would have looked better and would also made levelling horizontal and vertical surfaces a lot easier. One problem however, was that the spirit level was only fixed in a by a tight fit, and it would be possible to push it out with sufficient force. However, it's fairly simple to put it back in so there's no real problem here.



The '4 finger slot' grip, didn't turn out as well as I had hoped, the angle at which it bends, creates an uncomfortable position for the hand, however this grip is useful, for long measurements if the tape is hooked to a point, and then the product is being dragged a certain distance. The grip itself, does look good, it provides a nicely rounded shiny finish to the product. The product also offers the alternate grip, with the indented 'v' section, where two fingers may be placed to grip it, this grip, turned out quite well and made holding the product a lot more comfortable.



The stop/start button, works well with its knurling, this greatly improves its grip, and however it still rotates and would need some sort of guide to fix this. The knurling, and lathed finish on it, gives it very good aesthetics, I think this was a far better choice than the acrylic button.



Modifications During Manufacture

Originally I had intended to have two spirit levels in the product, however the two spirit levels I had were different widths, therefore I would only be able to accommodate one of them and only one is really necessary anyway. So, I decided just to use the round spirit level.



Another change was to have the smaller pin recessed into the product, this would greatly improve the products overall ergonomics and aesthetics as the pin would no longer be sticking out of the product causing it to be uneven.



Another large change was instead of having an acrylic stop/resume button, I decided to make it out of metal. This allowed me to give it a semi-circular shape and also knurl it to improve its grip.



I decided also that it would be best for the laser not to go entirely through the whole product, instead, it would be slanted at one end to give the impression that it is continuing right through the acrylic.



Another change to the initial design, was to include a nylon insert into the 8mm hole in the laser, this was to improve the ergonomics of the end section.

Criteria	Maximum mark	Mark awarded	Folio Page	Comment
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Product Testing

Functions

- The product includes a range of functions.
- I have included the spirit level and a laser leveller.
- As the product is a prototype only, it doesn't measure up to 5m.
- The product doesn't feature a cleaning function for the tape; however the surfaces of the product are easily cleaned.

Ergonomics

- The product is fairly simply to use.
- There are no sharp edges so it is comfortable for the user.
- The hand grip above the laser, didn't really improve the ergonomics, it was awkward to hold, however the indented section for the spirit level provides an alternate method of holding the product which turned out to be successful.
- The product is fairly light for its size.

Aesthetics

- The product has a nice colour scheme in keeping with the original product.
- The surfaces and edges are all finished to a high class standard, with knurling, and chamfer's on the lathed sections.
- The product features a company logo, which improves the overall aesthetic appeal.
- The product is in very good proportion, sufficient space was allocated to each function.

Safety

- The product is smooth with no sharp edges, therefore is very safe.

Materials

- The product features low cost materials, such as acrylic, and aluminium.
- The materials are strong and durable.
- The surfaces are very easy to clean.
- The product isn't that resistant to scratching as it is mostly acrylic.

Cost

- The product features low-cost materials.
- The processes used were fairly low-cost, if it were to be manufactured on a large scale.
- The prototype would cost less than £15 to manufacture.

Size/Weight

- The product is small enough to be easily held by the user.
- The product is shaped to provide alternate grips, so whichever suits the user.
- There is sufficient space to hold a measuring tape; however the pin would need to be altered to allow it to automatically retract.
- The overall product does not exceed 250mm by 150mm.
- The product doesn't fit into a standard tool belt, as with the additional functions it was too large for this.
- The product doesn't weigh anymore than 800 grams.

Plan Of Manufacture

Acrylic Mould

- I would initially get 4 pieces of wood, 240mm by 80mm.
- Hold them together with double-sided sticky tape.
- Cut out the outline, the slanted part above the grip.
- Then round the edge above the measuring tape.
- Drill 4 holes for the finger slots.
- Cut out the section underneath the holes for the laser.
- Drill an 8mm hole, 5mm deep, for the pin to be recessed below the 'v' section on each side.
- Drill a 4mm hole, right the way through for the pin to go through.
- Drill out the large circular sections on each side of the measuring tape, for the white plates to sit in 50mm in diameter, 3mm deep.
- I would split the mould, then cut out the 'v' section on the outer pieces.
- I would then glue each outer piece to each inner piece.
- I would the vacuum form each mould with yellow acrylic.
- I would then drill a 4mm hole on the end for the laser to be fitted to.
- With the two acrylic pieces ready, I would drill the hole for the circular spirit level at 30mm for each.
- I would use the gerbil to cut out the slot for the pause/resume button, and also to cut out the slot for the tape to come out of, at 20mm wide.
- I would then finish these sections with a file and emery cloth, then wet and dry paper.

White-Circular Sections

- I would cut out 2 squares of white acrylic, 500mm by 50mm,
- I would hold them together with double-sided sticky tape.
- Drill a 4mm hole in the centre, so it can be used with the jig.
- Using a jig, I would use the finisher to sand it down to a circle, 50mm in diameter.
- I'd then drill an 8mm hole, so that the pin can go through this as well.
- I would then finish the edges with a file, then emery cloth, wet and dry and finally polishing the edges.
- Lastly, I'd take the two pieces apart.

Laser

- I would use the lathe cut out 80mm of 12mm bar for the inner part of the laser, leaving a 4mm section on the end to go through the hole, for the laser head to attach to.
- I would cut the end of this at an angle with a senior hacksaw, and then file it down until it sits nicely on the slanted section of plastic.
- For the laser head, I would cut out a 15mm in diameter aluminium bar 12mm long.
- I would then use the lathe to drill an 8mm hole for an 8mm nylon insert.
- I would then apply some knurling to the head and also chamfer the edge of it.

Larger pin

- I would use the lathe to create this pin, initially I would get a 19mm aluminium bar.
- I'd tidy the edges up, and face-off the edge of the bar using the lathe.
- I'd then reduce 42mm of it down to 8mm thick, for going through the mould.
- I'd then knurl the head piece, and then chamfer it for aesthetics.
- Finally for this piece, I'd give it a screw thread on the end, by using a tap & dye set.
- The head on the other side, 19mm in diameter, 8mm long, to match the other side, would be screwed onto the other piece.
- So, I'd drill an 8mm hole with the lathe, and then thread it.
- I'd then also knurl and chamfer it to match the head on the other side.

Smaller Pin

- This pin will be recessed into the plastic; therefore the head will be 8mm wide and 5mm long, to sit flush.
- It would then be chamfered to improve its appearance,
- I would use lathe to cut an extra 42mm of 4mm on the rest of the bar.
- I'd then put a screw thread on the end so that a nut may be screwed *don* at the other side.

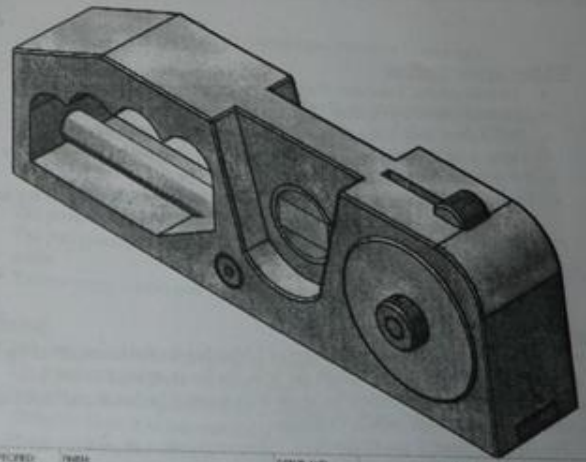
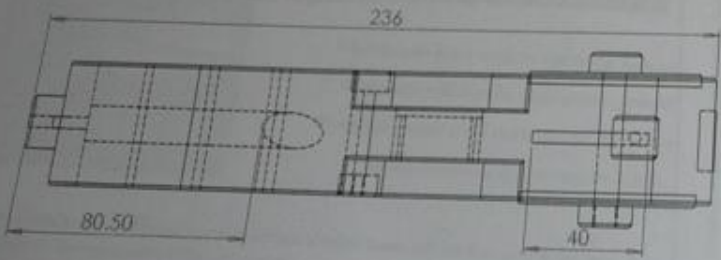
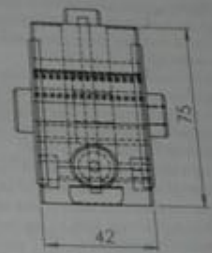
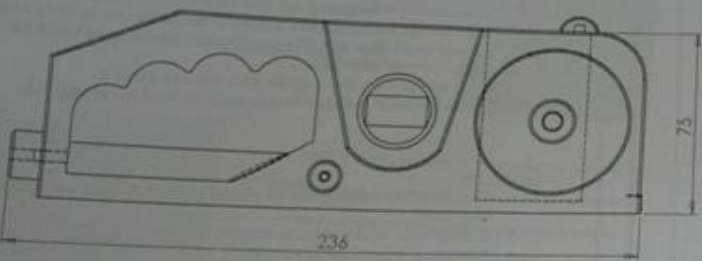
Pause/Resume Button

- I would use the lathe, to knurl and chamfer a 14mm section of 19mm aluminium bar.
- I'd then cut of this section using a senior back saw.
- After this, I'd cut the section through the centre, so that the button is rounded and the knurling facing upwards, with the flat side on the underneath.
- Then I'd drill a 3.9mm hole on the flat side, for a pin to be press fitted through to hold the button in.
- I'd lathe a pin, 4mm in diameter with a 9mm head on it, this will then be press fitted into the button, through the 4mm slot above the measuring tape.

AS Unit 2: Product Development

Mark: _____ Folio: _____ Comment: _____

Working Drawings

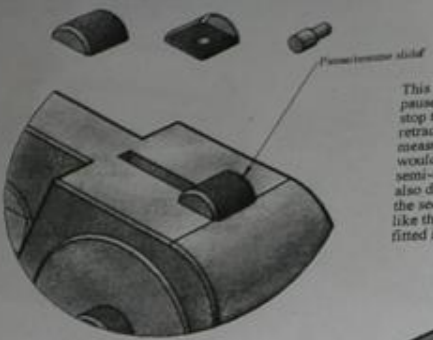


UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETRES SURFACE FINISH TOLERANCES UNLESS SPECIFIED		FINISH	EDGES AND BREAK SHARP EDGES	DO NOT SCALE DRAWING	REVISION
DATE	NAME	SIGNATURE	DATE		TITLE

Centre name: _____ Centre number: 71
 Candidate number: _____

AS Unit 2: Product Development

Development Of Ideas

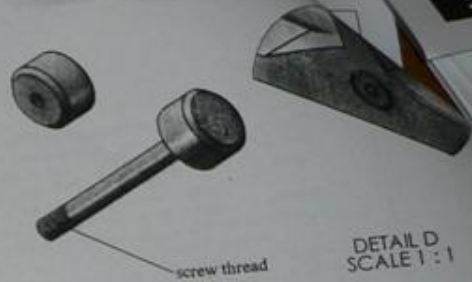


This is how I could make the pause/resuser slider, which would stop the measuring tape from retracting when the user is taking measurements. The slider itself would be a knurled and chamfered semi-circle for extra grip, I would also drill a 3.9mm hole as shown in the second image, so that a 4mm pin like the one above could be press-fitted into it, to hold it in place.

DETAIL B
 SCALE 1 : 1



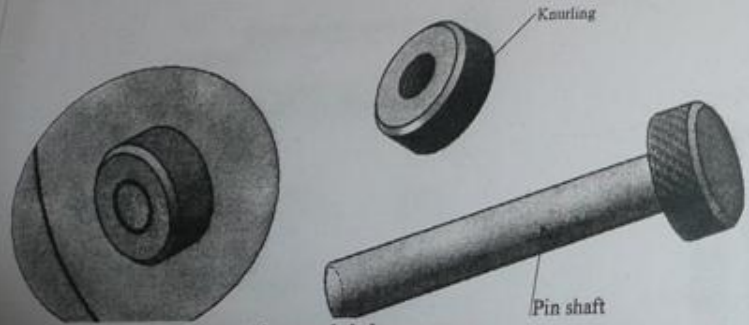
On the right, is a way in which I could do the second smaller pin, as shown it could be threaded so the pin head can simply screw on. It would also include chamfers, and if I do this I would aim to have it recessed in to the product so that it is flush.



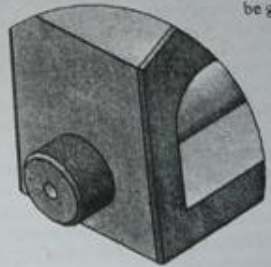
DETAIL D
 SCALE 1 : 1

Below, is how I think I could insert the laser into the product. As shown there is a cut section at an angle near the end of the laser tube, this is so it sits nicely on the plastic, and gives the appearance that it is going through the plastic, as it would be impractical to drill a large 12mm hole through the plastic from that position. I would also have a 3.9mm bar coming out of it, going through the plastic, for the laser-head which would have a 4.1mm hole to be press-fitted on, the laser would then be glued to keep it more secure.

Below is another design for a pin, which would be used to help hold the two part mould together, as shown I could knurl and chamfer the outer pin heads for greater aesthetic appeal. I could use either a tight fit, by having the pin shaft at 8.1mm and the pin head's hole at 8mm. However I think I will probably try to thread them together by using a tap & die set.



DETAIL N
 SCALE 2 : 2.2



DETAIL E
 SCALE 1 : 1



DRAWN	NAME	SIGNATURE	DATE	CHECK AND BREAK SHARP EDGES	DO NOT SCALE DRAWING	REVISION

AS Unit 2: Product Development

Criteria	Maximum mark	Mark awarded	Folio Page No.	Comment

Evaluation of Ideas

Ergonomical Ideas

On the first page, I experimented with having some sort of grip on the bottom of the product using finger slots (1a, 1b) this would be ok for basic measuring, but it wouldn't work for the spirit levels or the laser unless the bottom was flat, therefore this would be unadvisable, also the measurements would be slightly off, as you fingers would be keeping the tape of the item being measured.

The aluminium belt clip and the wrist strap (1c, 1d), were good ideas for a smaller product, for example if it was simply a measuring tape, however with the addition of the laser and spirit levels, the product will be substantially larger, therefore impractical to carry on your wrist or belt.

The best option I think, was the section cut out for the laser (2a, 2b, 2c, 2d), this could include finger slots as shown on the third page (4d, 4f), allowing the product to be easily transported and uses. Also with the indented 'v' section for the spirit levels (3b), this allows the user to put his or her fingers ion this and grip it here. Increasing the ergonomics of the product. The switches themselves didn't feature any real grip (1a, 1b). Something like knurling would have a far better effect for this, which I will definitely look at later.

Functional Ideas

The functions considered where the addition of spirit levels and a laser. Throughout my ideas I looked at the best possible ways to accommodate them in the product.

The first page featured an idea for the laser, where it was inside the product (1e), but this would increase the height of it, and the laser wouldn't be on the flat surface, therefore measurements would be off. The only solution was to have it to the side of it, perhaps adding a handle (7b, 2c, 2d), with the finger slots to improve the grip (4d), this idea seemed to accommodate well, however a problem arose with the laser going through the plastic itself, as drilling a 12mm hole through two bits would be impractical, so I will need to look at a different way of accommodating it.

The first idea for the spirit levels was to have them on an attachment to the side of the product (1f), which would've worked very well; however with the inclusion of the laser, this presented problems. I think it was a good idea, to have the spirit levels in the centre of the product as this would improve the aesthetics (3a). The spirit levels at right angles to one another, means that horizontal and flat surfaces could be checked for levelness. However this can be achieved with just one if the project is rotated, therefore 2 spirit levels isn't really necessary and would be difficult to include 2. The indented 'v' section for the levels was a good idea (3b), as the product would've been very wide, and as the levels don't take up much room, it would have large gaps if this was left, therefore the indent is very suitable and also improves the grip and aesthetics.

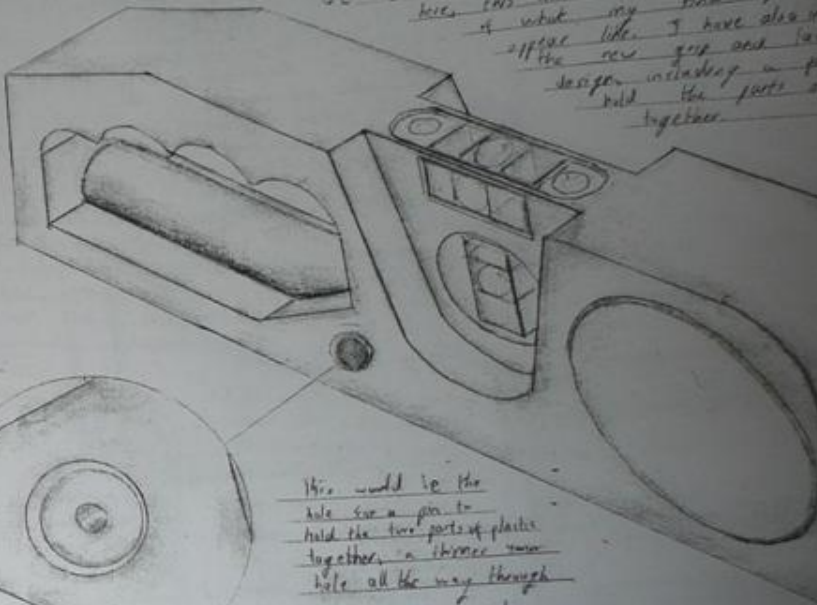
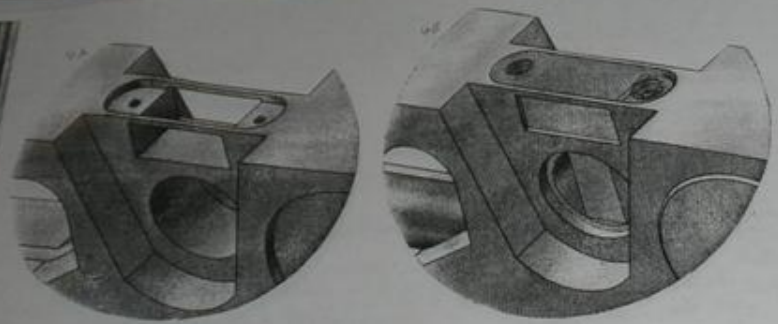
Aesthetical Ideas

For the aesthetics I think it was a good idea to retain the white circular insert on the side of the tape, in keeping with the original design. Things like the laser on the underneath (1e) and the spirit levels without the 'v' indent (3a) didn't have much aesthetical appeal; therefore I think that later designs were much better. The laser also will go through a slanted section of the product under the handle (4d), this will greatly improve the aesthetics so it doesn't look to rectangular, it's similar with the rounded edge and angled edge ion the top corners of the product. I think if put a pin in the side, it should be recessed as already shown (4f), this will defiantly increase it's aesthetics, things like knurling and chamfering on pins and on the laser (4c) also, greatly improve the product's aesthetical appeal.

AS Unit 2: Product Development

Criteria	Maximum mark	Mark awarded	Folio Page No.	Comment
Investigation and analysis of product	20	16	19	

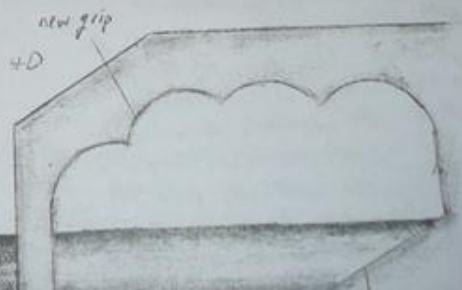
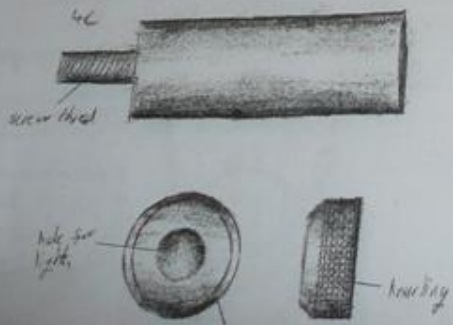
CONCEPT SKETCHES 115



I have put all of my ideas together here. This should be a good product if what my final product appears like. I have also included the new grip and have designed including a pin to hold the parts together.

Below is an idea for creating the base, which will be made using a lathe machine. The head and body could be separate, allowing the head to be secured on a screw thread in the body. I would include a chamfer and a knurling effect in the lower head for aesthetic appeal.

This would be the hole for a pin to hold the two parts of plastic together. A thinner hole all the way through for the screw and a larger hole acting as a counterbore for the nut.



I could cut these into the singer slate into the mould. This would improve the ergonomics and aesthetics of the product. Also for aesthetic appeal, I wanted the base to glow into the slanted section of the plastic. In this I would have to...

Centre name _____

Centre number _____

Candidate _____

Redesign Specification

Functions

- The product must feature a range of different functions.
- It should have additional functions along with the main one including perhaps a spirit level and a laser leveler.
- The measuring tape must be able to measure 5m.
- The tape should feature some sort of cleaning function for the tape.

Ergonomics

- The product must be simple to use.
- The product should have no sharp edges, so it's more comfortable for the user.
- The product should be a good design, so it is easier for the user to comfortably hold/grip it.
- The product should be reasonably light so it's easier for the user to hold.
- The tape should be easy to use over large distances.

Aesthetics

- The product should have an attractive colour scheme for the user.
- It should have all edges and faces done to a high quality finish.
- It should feature a company logo for realism and to enhance the overall aesthetic appearance.
- The product should fit in with its working environment.
- All parts of the product should be in proportion.

Safety

- The product should have smooth surfaces so that the user will not get any cuts from sharp edges.

Materials

- The product should feature low-cost material and use standard components where appropriate.
- The materials chosen should be strong and durable.
- All of the materials should be easy to clean.
- The materials selected should be resistant to scratching.

Cost

- The product must have low-cost materials.
- The processes used in the manufacture of the product must also be reasonably low-cost.
- The prototype should cost no more than £15 to manufacture.

Size/Weight

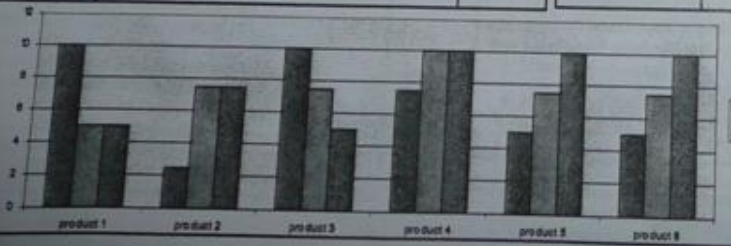
- The product must be small enough to be easily held by the user.
- The product should be shaped to provide a good grip for the user as well.
- It must be the right size in order to hold a measuring tape inside and to have room for additional functions.
- The overall product should not exceed 250mm by 150mm.
- It should fit into a standard tool belt.
- It should weigh no more than 800grams.

Analysis

Product #4		
factor	description	Rating
Function	The auto-retractable tape is useful instead of winding it up. The pause/resume button is helpful as it can keep the tape at a fixed measurement when you need it to. It has a standard 5m tape which is a reasonable length for a measuring tape. It features a wrist strap as an additional function which is very useful when transporting the tape.	7.5
Fitness for purpose	I think it is a fairly standard tape measure and carries out its purpose well. However I think it could've done with a few more additional functions.	5
Design features	The product has an all-over grip which is textured giving it an even better grip, the wrist strap also makes it easier to hold.	5
Materials + Industrial production methods	The grips and the body are injection moulded to create the complex shape and textures; this gives a nice smooth shiny finish which is very appealing. As it is injection moulded it is cost-efficient and good for mass-production this is very good as it means it is cheaper for the consumer. (rivets for the end attachment are strong and sturdy.)	10
ergonomics	I think the grip is very well textured as is the stop and start button. The wrist strap also adds to the comfort of the product making it easier to hold. The positioning of the start/stop button isn't very good as it is too far away for the thumb to reach comfortably.	10
aesthetics	The product uses black and yellow colours and is a nice small shape which is reasonably appealing. The product is well proportioned and looks industrial.	10
Safety	The product appears reasonably safe however there is a space under the stop/start button where fingers could get caught and perhaps nip them.	7.5
maintenance	The product has good smooth plastic surfaces which are easily cleaned. However dust can gather in the textured grip and the wrist strap.	5
Total		60/80

Product #5		
factor	description	Rating
Function	The auto-retractable tape function is very useful. The clip on the side is very handy for carrying the tape around and also lowers the chances of leaving it somewhere and forgetting about it. The pause/resume button is also good for keeping the tape at a certain length.	5
Fitness for purpose	This product works well the grip is reasonable, the belt clip on the side is also a very good idea. It could have used a few more functions though.	5
Design features	The product has the belt clip for easier transport and accessibility also it has a good grip on the back of it.	7.5
Materials + Industrial production methods	The product uses polythene for the plastic parts which are easily injection moulded, I think this process give it a nice finish. It uses stainless steel for the clip which is a good material because it is cheap and very malleable. The polythene for the shell is injection moulded which is very good for mass-production thus reducing the price.	10
ergonomics	The product has a reasonable grip. The belt clip on the side is very useful. So the user doesn't have to hold it in his or her hand when carrying it around. The locking mechanism is positioned appropriately with a good grip. The tape itself is fairly easy to read also.	10
aesthetics	The yellow and black are again very attractive. It has a nice finish. However the circular pattern in the side-profile of the grip could've perhaps looked better.	7.5
Safety	The product is very safe. There are no holes or anything like that as featured in some of the other products.	10
maintenance	The smooth plastic surfaces are easily wiped clean. However the ribbed casing may prove to be difficult to keep clean.	5
Total		60/80

Product #6		
factor	description	Rating
Function	This is a larger measuring tape mainly used for measuring football pitches and long lengths like that so it has a longer tape which is good as there are longer lengths. It also features different measuring units on each side of the tape itself which is good as certain measurements are more associated with certain types of units.	5
Fitness for purpose	It is very good for its purpose, however the tape can be blown away at the end and needs some sort of weight to keep it down.	5
Design features	It features a handle grip. It has a handle also to wind the tape up again.	1
Materials + Industrial production methods	This product uses polythene for the over all casing then polythene again for the winding handle. The acrylic is heated and bent into shape. The winding handle is injection moulded. This is also cost efficient as the mould can be re-used for mass production.	1
ergonomics	The product has a very good handle which is easy to hold. The winding handle seems abit small and boxer this could've been improved. different measuring units on either side of the tape, which is very useful instead of having to convert measurements. The tape is very large so it is easy to read. It is fairly heavy but the handle compensates for this. So I would say it has a good weight.	7
aesthetics	The whole product looks very unappealing. Perhaps a complete casing would've looked better. It looks very boxy and plain with just yellow.	2
Safety	The product is very simple and seems reasonably safe. The winder can cause wrist injuries however. It has a sharp spike which is pretty dangerous, if it was dropped onto your foot it could cause injuries.	1
maintenance	The product is very simple to clean in terms of the plastic. The tape can gather dirt though. And unwind its self which would be annoying.	1
Total		25



Product #1 Digital Measuring Tape	60	Product #4 Rubber Covered Measuring Tape	60
Product #2 Baofeng measuring Tape	50	Product #5 Varnell Measuring Tape	60
Product #3 Calculator/ Measuring Tape	50	Product #6 Vinex Measuring Tape	55

Conclusion On the left I made a bar graph comparing the products in terms of functions (blue), aesthetics (red) and ergonomics (green). In conclusion, the product I would like to choose to improve is the Baofeng measuring tape. I would like to improve it as it didn't seem to have very many functions it was very basic and I think it has a lot of potential for improvement. I would like to make improvements to this product in terms of it's functions, ergonomics and aesthetics.

Product #1			Product #2			Product #3		
factor	description	Rating		description	Rating	factor	description	Rating
Function	It is a lot easier to read because it displays the measurements on a digital display also making them more accurate and precise. It also saves measurements which is handier instead of having to remember them. Auto-retractable, start/stop button is useful to keep it fixed at a certain length.	10	Function	This product has very little functions all it really has is a stop/resume button which is pretty much standard for most measuring tapes. It does not have a belt clip which would have improved it a lot.	2.5	Function	The measuring tape has an additional fold out calculator which is very useful for working out and dealing with measurements. It also has space for a notepad, which is handy to keep a record of all the measurements you have taken them also for working out sums. The stop/resume button is helpful also for keeping the tape at a fixed length.	10
Fitness for purpose	It is very good for taking accurate measurements and recording them for the user. The shape and size make it very easy to use.	10	Fitness for purpose	It is a good simple measuring tape. It is pretty basic but could have done with a few more additional functions	5	Fitness for purpose	This product is very handy the calculator and notepad are ideal for this product as they help the user to record and calculate measurements.	10
Design features	Provides an LCD digital display for measurements which is very easy to read and gives more accurate measurements which is better. (Gives measurements to 1/16 of an inch). It has a decent sized 5 metres tape length. It is easy to use the control panel and records measurements.	10	Design features	It has a circular grip round it which makes it a lot easier to hold. It has a moulded stop/start button which is good so the user can flick it on/off easier. The stainless steel clip at the end of the tape makes it easier to measure things as it can clip onto a corner then the main body of the tape can be dragged away for the desired distance. Which is very useful.	7.5	Design features	The product has a fold-out calculator which is handy for storage. The notepad also easily fits inside which is very useful.	10
Materials + Industrial production methods	The casing is injection moulded with polythene. This provides a nice finish. This means it can be mass produced which lowers the price.	7.5	Materials + Industrial production methods	The casing is injection moulded which is good for mass production, the acrylic is also very easily laser cut. The black rubber grip is also very good in terms of ergonomics as it has a lot of grip. However it doesn't seem very resistant to impact.	7.5	Materials + Industrial production methods	The black and grey polythene parts are both injection moulded as is the bracket parts for the calculator, this means they will already have a nice finish to them and smooth edges which is nicer for the user. The product seems very complex though and would require a lot of manufacturing. It would be difficult to change the batteries as well.	5
ergonomics	The digital display is helpful also as it saves measurements. A downside to the user is its poor grip which means little comfort. The control panel also looks fairly complicated. The aluminium clip at the end of the tape is very useful for taking measurements. When in use your hand may block the LCD display.	5	ergonomics	It has a black circular rubber grip which makes it a lot more comfortable to hold opposed to just polythene. It has a moulded start and resume button which provides good grip for this also. Measurements on the ruler are fairly easy to read.	7.5	ergonomics	The product is very useful for the user in terms of recording measurements. However the casing seems very boxy and there doesn't appear to be any real grip. The buttons seem very close together and all of it seems very cramped. The calculator seems very small which would make it difficult to read.	5
aesthetics	The product has nicely rounded edges which looks well. However the colours of white and dark grey are very dull. It should perhaps have made use of yellow and black to give it a more industrial look.	5	aesthetics	The yellows and black are very attractive. The stop and start button seems abit boxy compared to the rest and perhaps could have been improved. It seems to have a fairly dated image, but does have an industrial look.	7.5	aesthetics	The product is very boxy. However the plastics have a nice finish. The fold in calculator is also very stylish and improves its appearance	7.5
Safety	The product seems fairly safe however as it is electrical. This provides some danger. There also appears to be a gap in the casing under the pause and resume button this means your finger could get caught or water could get in and perhaps raise the chances of electric shocks. Therefore I think it's not as safe as it could be.	5	Safety	The product seems very safe it has a good grip and is nicely shaped to fit in the hand so unlikely to be dropped and cause damage. The rapid retraction could be harmful with the use of a sharp measuring tape.	5	Safety	I think that the product is fairly safe however with the flap for the calculator it is possible for fingers to get caught.	5
maintenance	The product is easily cleaned as it has a smooth plastic finish. The LCD display isn't protected however, therefore could break.	7.5	maintenance	The product has smooth plastic edges and is easily cleaned. The centre piece would be difficult to keep clean.	7.5	maintenance	The notepad would eventually run out and it would be difficult finding the right paper size for a replacement. The calculator buttons would also gather up dust. So I think it has a fair bit of maintenance compared to the other products. It would be an annoyance to have to change the calculator batteries. The hinges may break with the continual opening and closing of the calculator.	2.5

Investigation

Introduction: My name is ~~F. Williams~~. This is the start of my A3-level project. For it I have chosen to take a look at different types of tape measures and will be attempting to make an improvement to one of them. On this page I will look at six similar types of tape measures and will examine them in detail. Taking note of the different functions that they have, the different design features in them, materials and industrial processes used in manufacturing them, the ergonomics and aesthetics of the products to make them more user-friendly.

Product #1 Digital Measuring Tape

Function: This is a digital measuring tape. With an LCD display that will show measurements accurately. It also saves measurements on to system. The display will turn on when the tape is pulled out and off when the tape is retracted. It displays measurements in fractions of inches even 1/16 like an ordinary measuring tape. It is auto-retractable. It can give measurements in either foot and inches or metric units.

Design Features: The measuring tape has a stop and resume button for holding the tape still. It has an LCD display for reading measurements. It has a control panel to shuffle through each recorded measurement. It has a stainless steel attachment on the end for hooking the end of the tape on to objects. It is attached using recessed rivets.

Materials + industrial processes:
Casing made from ABS, which is injection moulded. Standard components are used to keep the split casings together.

Ergonomics + Aesthetics: It has a modern style and the parts are in proportion. The digital measuring tape features no extra grip. It has a stop/resume button near the top for easier access. This is 76mm by 76mm by 33mm. This product weighs 430grams. It has a circular shaped control panel. It has rounded corners. It uses white and grey coloured ABS for the casing.

Cost: This particular product is usually priced around £25.



Product #2 Roofing measuring Tape

Function: The Roofing has a 5m tape measure. It has an Auto-retractable tape measure. It also has a pause/resume button; this stops the tape from being allowed to be pulled any further out or to retract back in.

Design Features: This tape measure has a circular grip round it, it has a moulded stop/start button. It has an overall circular shape, which fits round the hand. The end of the tape features an extra gripping attachment made from stainless steel and is held on with pressed rivets.

Materials + industrial processes:
It is made from a two part mould, held together with recessed nuts. The shell of this product is injection moulded using polythene, the acrylic white section has been laser cut.

Ergonomics + Aesthetics: It has a rounded circular style. This measuring tape features a black circular rubber grip running the whole way round the outside for better comfort in the users hand. It has a start and resume button which is moulded and provides a good surface for the user to grip. The product is 73mm diameter in the circular section and is 30mm thick. This measuring tape weighs 390grams. It has a very rounded shape with no apparent sharp corners. It mainly uses yellow polythene for the casing.

Cost: this product would usually be priced for around £19.99



Product #3 Calculator Measuring Tape

Function: This is another measuring tape which has the addition of a calculator that folds out from the side. Also underneath the calculator is a pencil notepad for recording measurements and for working out calculations.

Design Features: The calculator easily folds out on a set of hinges made from polythene injection moulded into this shape. There is a hollow part to allow room for the notepad. The metal attachment at the end of the tape measure is made from stainless steel and is attached using recessed rivets.

Materials + industrial processes:
Most of this product is injection moulded with polythene. The black and grey sections both use this process as do the hinges that allow the calculator to fold out.

Ergonomics + Aesthetics: The product is will fit in the users hand. It has no apparent grip. The product is 76mm by 50mm and is 40mm thick. This product weighs approximately 420grams. The attachment at the end of the tape makes it easier to hook the tape onto objects and measure them. The calculator folds in, along with the notepad which fits inside making it more compact.

Cost: this product would usually cost around £20-25



Product #4 Rubber Covered Measuring Tape

Function: This measuring tape, has an auto-retractable tape measure. It has a 5m tape measure and also wrist strap so it can hang on the user's wrist.

Design Features: The product has a polythene grip all over in a circular pattern. The pause/resume button is moulded and slides back and forth for each state. It has a stainless steel part at the end of the tape to grip items when measuring. It features a wrist strap on the back of it from attaching to the hand.

Materials + industrial processes: Most of this product is injection moulded using polythene. The grip and the shell both use this process. The wrist strap is fixed to the tape measure using a process called crimping. The stainless steel attachment at the end is attached using recessed rivets.

Ergonomics + Aesthetics: The wrist strap makes it easier for the user to hold and transport the product. It also lessens the risk of it being dropped and casing damage. The moulded plastic grip means the user can hold it more comfortably. The measuring tape is in a circular shape, it has black polythene for the grip and also yellow polythene for the casing. This product measures 68mm in the circular diameter section and 38mm in width. This example weighs just over 400grams.

Cost: This particular product would normally sell for around £17.99



Product #5 Varnell Measuring Tape

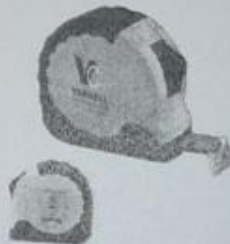
Function: This measuring tape also has a 5m tape. It has a start/stop button which stops the tape from moving when the user doesn't intend it to. It can also be attached to the user's trousers/belt with the use of the additional clip.

Design Features: This product has a clip made from stainless steel which allows the user to clip it onto his or her trousers and carry the product. It has a black moulded grip. It has a stainless steel piece attached to the end of the tape measure which secures it to edges when measuring.

Materials + industrial processes:
The polythene for the shell is injection moulded as is the black grip and the pause/resume button. The aluminium part at the end of the tape is held on by recessed rivets. The clip on the side of the tape measure is made from stainless steel and is attached with a countersunk screw.

Ergonomics + Aesthetics: The product has a black grip over the hole back of it. It has a belt clip on the side so the user doesn't have to hold it in his or her hand when carrying it around. The tape's size is 71mm by 71mm by 35mm. It weighs approximately over 395 grams. The product uses black polythene for the grip and stop/resume button and yellow polythene for the rest of the casing. The logo also enhances the aesthetic appeal of the overall product.

Cost: This particular product is usually priced at over £20



Product #6 Vlnex Measuring Tape

Function: This is a larger measuring tape mainly used for surveying/ marking out long lengths for example football pitches or building sites.

Design Features: It features a handle grip. It has a handle also to wind the tape up again. The marker spike at the bottom is made from stainless steel and is used to keep the product fixed to a point. The metal attachment at the end of the tape measure is looped so it can be put around something then the distance from that can be measured.

Materials + industrial processes:
This is created by injection moulding polythene. The winding handle is injection moulded using black polythene. The mould can be re-used for this product. The lettering on the product is put on with vinyl stickers. The attachment at the end of the tape is made from stainless steel with the centre part sheared, it also uses recessed rivets for attachment.

Ergonomics + Aesthetics: The product has a moulded winding handle for the user to hold and to use to wind up the tape measure. It also has a handle on the top to hold the overall product. The product is 380mm in height and 305mm in width. The Vlnex is the heaviest example and weighs around 850grams. Due to the way the tape comes out it only really works in the right hand.

Cost: This particular product is usually priced at ~~over~~ £30





base section slightly
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line

disturb removed
by team

projection
base throughout
the product

As shown above I considered
side of the bottom of the element
to allow room for the
it would be able to
proportional, this
overall appearance
the product

the layout
level, this takes up less
vertical space in the product
I have also decided to
that section's measurement
fingers can fit

nearby space



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AS GCE Advanced Candidate Summer 2011
Centre name: _____
AS Unit 2: Product Criteria

ing slightly
cubic

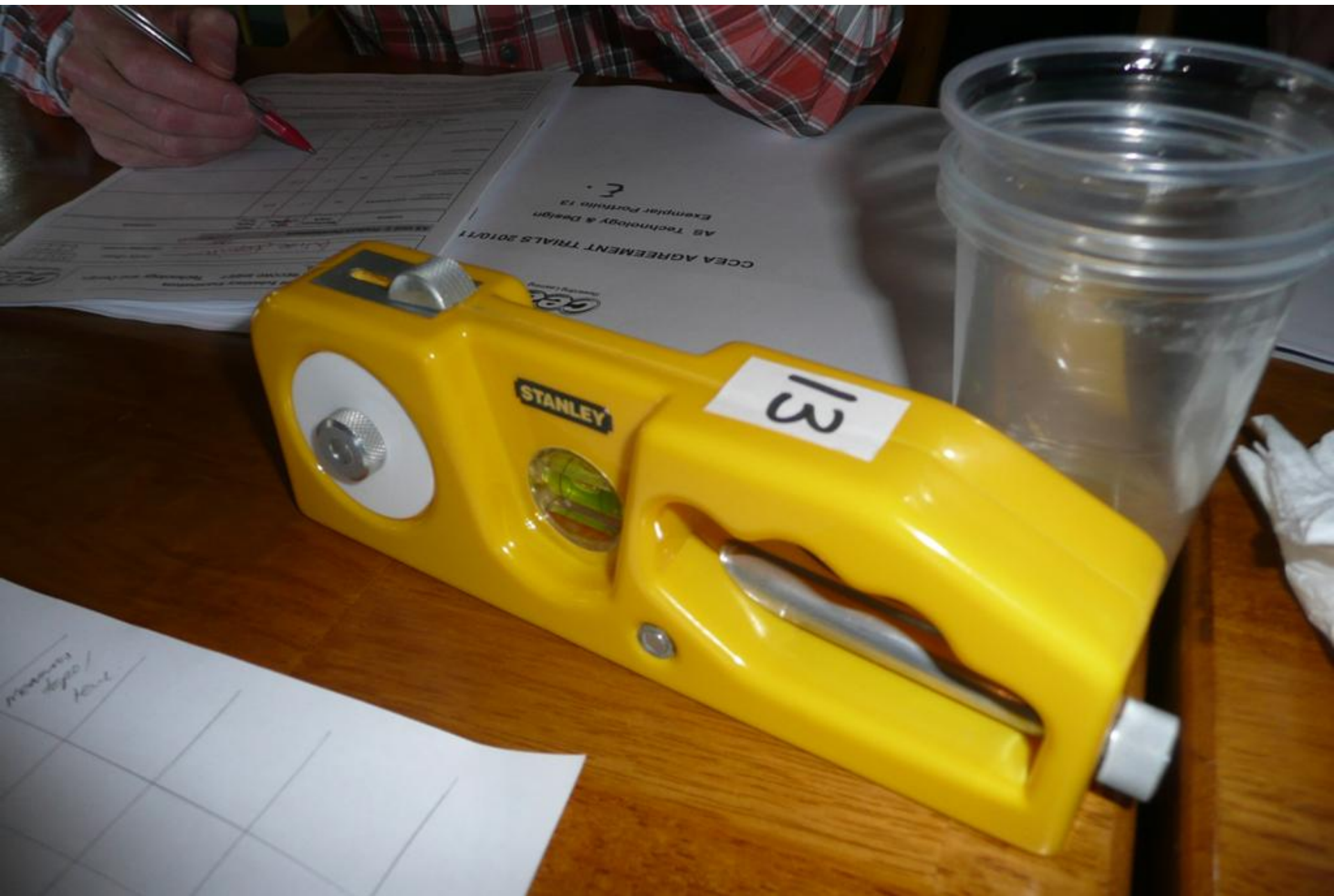
disturbance mirrored
by 10mm

As shown above I
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to allow
it

projection of
lower than
the

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bottom spirit level
would sit nicely in a 55mm hole
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one above, except I changed
the layout of the top spirit
level, this takes up less
vertical space so
I have also
this

new top spirit level

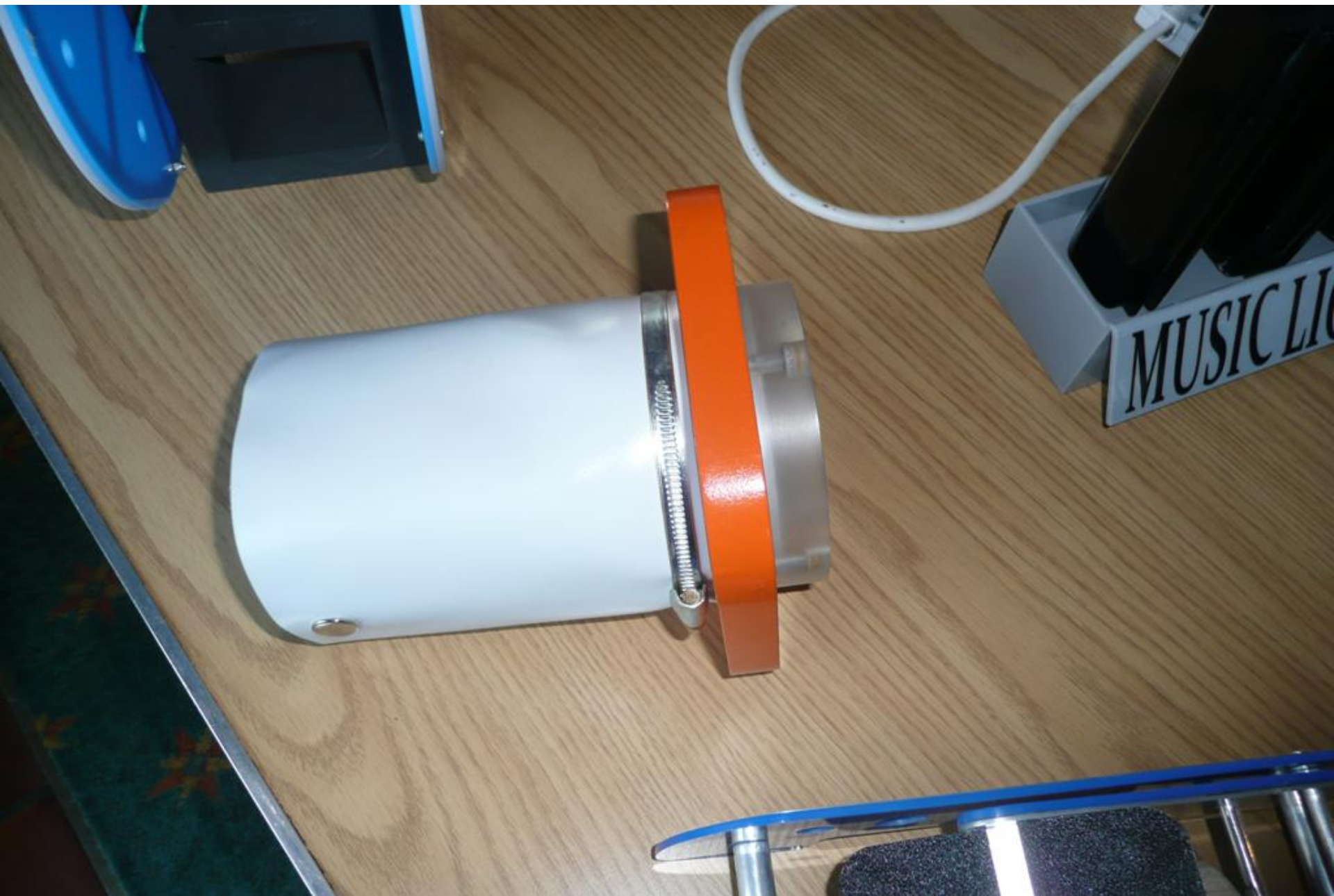


CCEA AGREEMENT TRIALS 2010/11
AS Technology & Design
Exemplar Portfolio 13

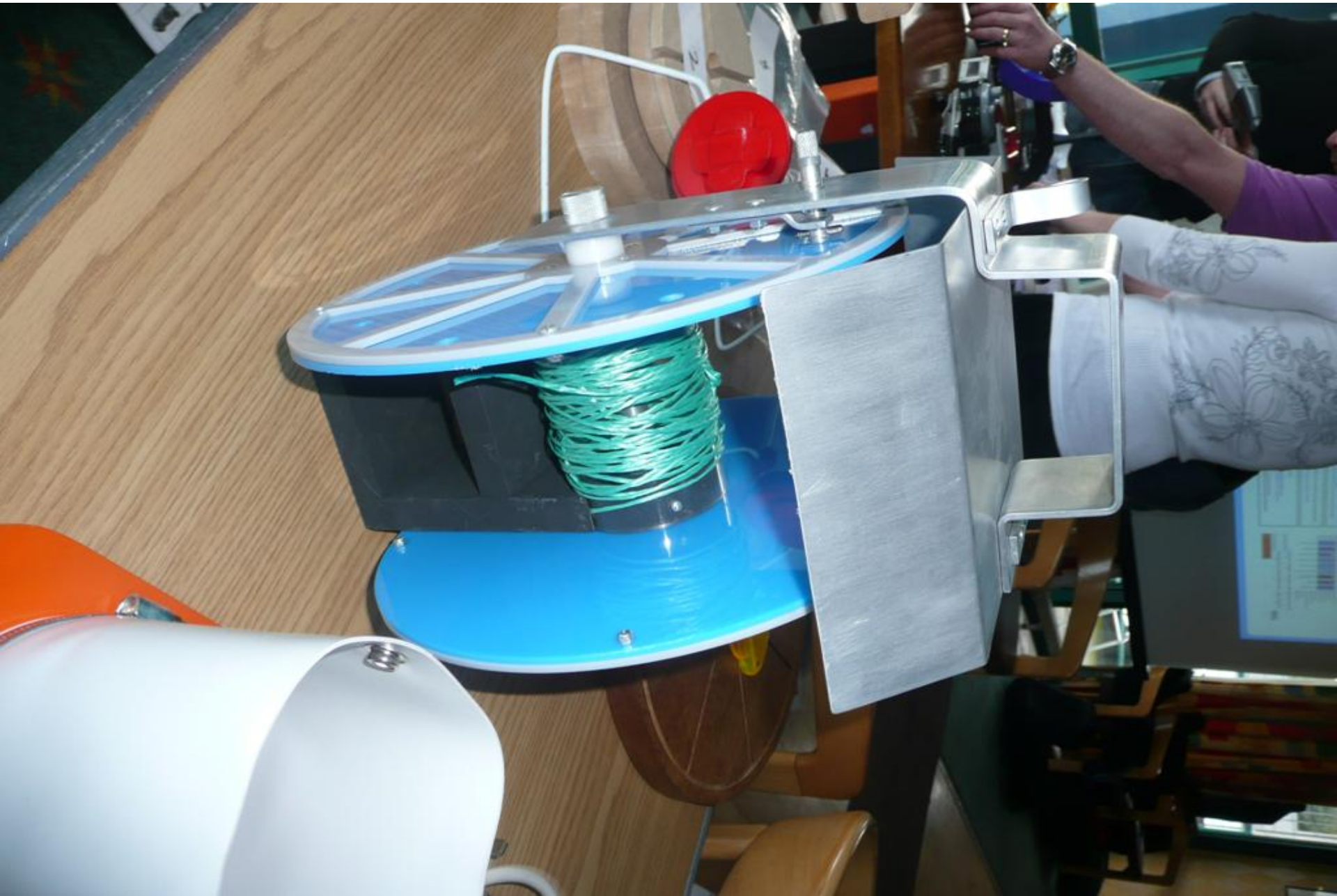
13

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Minimum depth / hour



MUSIC LI









...TECHNOLOGY AND DESIGN
...Moderator's Report
...will come to complete product development under their product design
...the confidence in this unit is on the analysis and development of an existing
...to re-designing under the product for an aspect of it. There were very few
...recommending the number of papers assigned to mark within the given
...exceeded the number of papers assigned to mark within the given
...done and is not a good practice to follow as students are not
...time assessment criteria. It is the responsibility of the teacher to
...and challenge at AS level.

...SIS OF PRODUCT
...this section although some still used the headings
...headings outlined in the assessment criteria for the
...show a clear conclusion or starting point for their
...ENT
...rare to see a detailed quantifiable
...and CAD in some centres.
...modifications to their redesigns
...lot of centres teacher and
...manufacture.
...is section, due
...manufacture
...expectation
...land



13

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Date: _____
Fax: (028) 90226 1234

Name, FILL home postal address and National Insurance Number MUST be completed Please use BLOCK CAPITALS	
Mr & Mrs M. Moore 16, 51, 12 St Rene Road, Lisburn Co. Down, BT28 2JQ	
School at which teaching	Green To Rannagh 100 Linnahilly Rd BELFAH ST 100 Mrs To Belfah 100







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GCE Advanced Subsidiary Examinations
CANDIDATE RECORD SHEET
Technology and Design
Summer 2008



Rewarding Learning

Centre name:
Summer 2008

Management		Manufacturing		Product solutions and development		Investigation and analysis		TOTAL	
40	30	40	30	20	30	20	30	100	100

(Candidate)
I have received from my teacher or others that have been
involved in the assessment's own name and that it has been completed in accordance with the conditions
(Teacher)
I have checked this candidate's work and it has been completed in accordance with the conditions
I have checked this candidate's work and it has been completed in accordance with the conditions
I have checked this candidate's work and it has been completed in accordance with the conditions



CS3
Advanced Assembly Experiment
MACHINE 480/3200 480E1 Technology and Design
Date: 2008

NAME	DATE