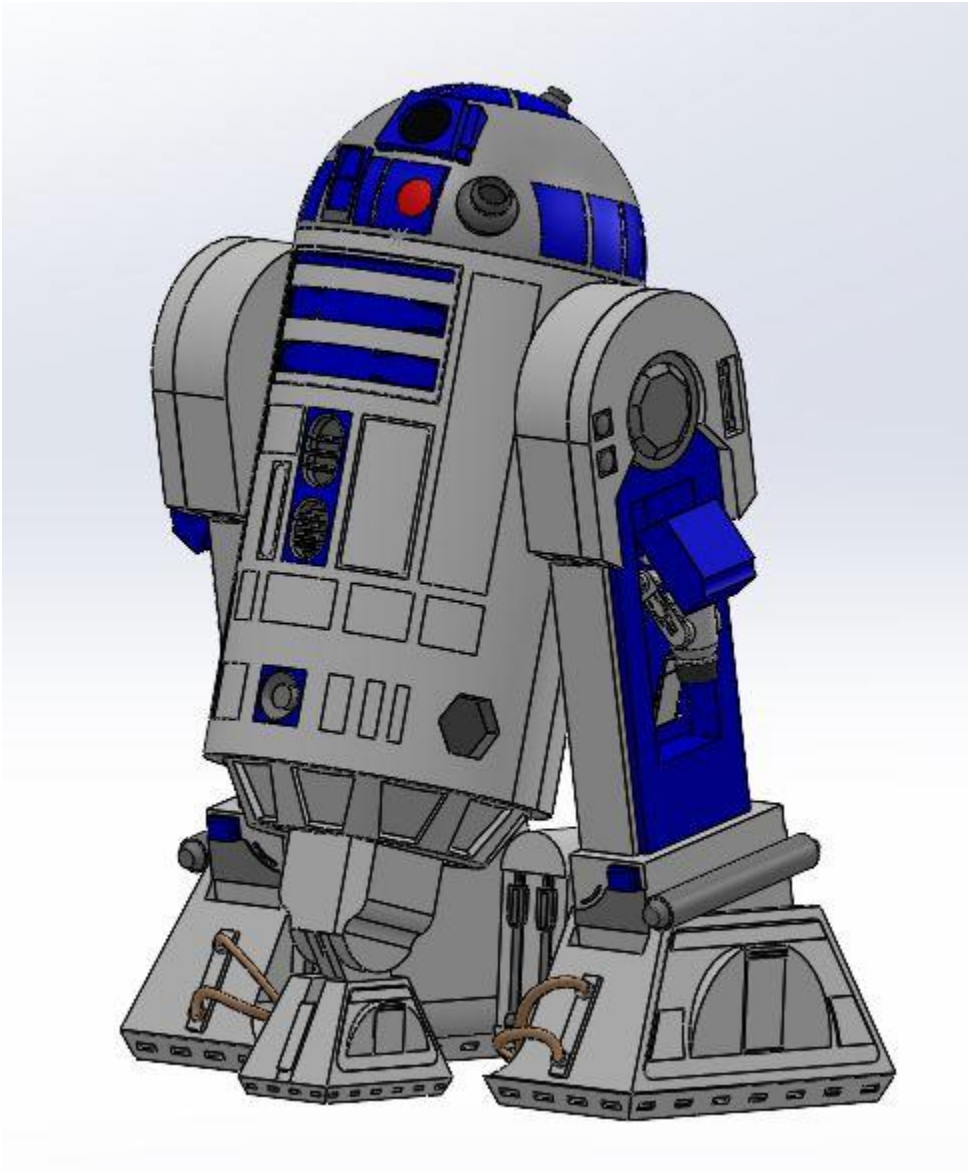
Team 6 ENG 04 Project: R2-D2



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3/10/21

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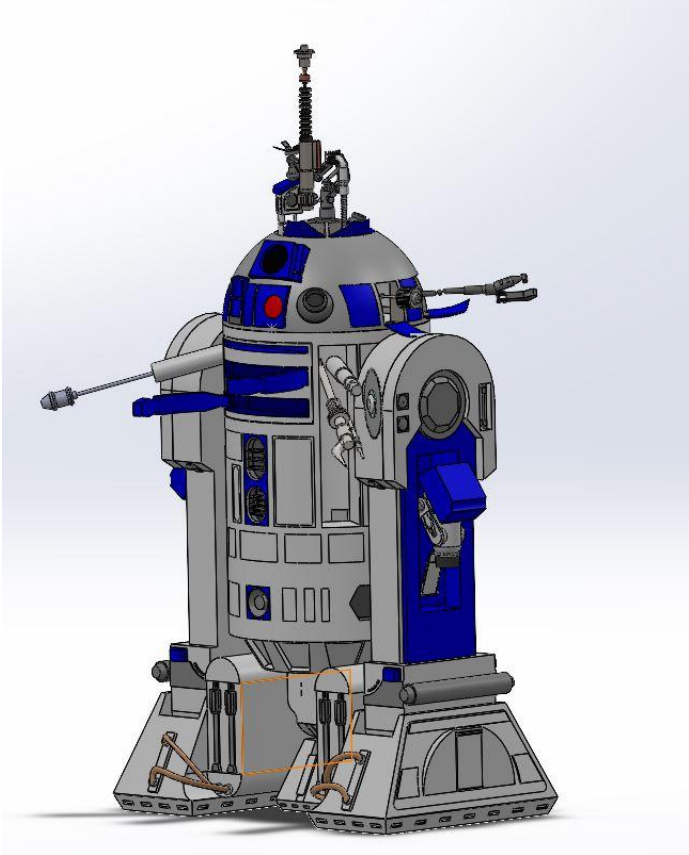
Assembly Description:

R2-D2 is one of the most iconic and recognizable figures in movie pop-culture, therefore our group chose to create a nearly life-size replica of R2-D2 for our project. R2-D2 is a cylindrical droid from the Star Wars Saga who serves many distinguished Jedi heroes. Referencing online documents containing real-world dimensions, we built R2-D2 from creating his basic body to installing some of his most important tools. R2-D2 consists of 16 primary parts and subassemblies, which are his Cylindrical Body, Hemispherical Head, Rectangular Legs, Feet, Retractable Third Leg, Rocket Boosters, Spacecraft Control Arms, Inflight Maintenance Arm, Buzzsaw, Utility Arm, Multi-Function Arm, Periscope, Drink Serving Arm, Fire Extinguisher, Communication Sensor, and Luke's Lightsaber. Also, many unique flaps and hinges were built to connect and protect many of R2-D2's components. To add to the scope of the project, most of what was mentioned are subassemblies consisting anywhere from 3 parts all the way to 20 parts. Each member was assigned 4 subassemblies to complete. Zhaolun was in charge of the Cylindrical Body and its main extrusions, Multi-Function Arm, Fire Extinguisher, and Inflight Maintenance Arm. Julian was in charge of the Periscope, Retractable Leg, Buzzsaw, and Utility Arm. Kevin



was in charge of the Head, Luke's Lightsaber, Communication Sensor, and the Drink Serving Arm. Kevin also made all the custom flaps on the head. Jordan was in charge of the Rectangular Legs, Feet, Rocket Boosters, and Spacecraft Control Arms. In addition, Jordan detailed the Cylindrical Body and colored all of R2-D2.

The main body was built first to help define the dimensions of all of R2-D2's tools. The main body consisted of the Cylindrical Body, Legs, and Feet. Once these parts were made, the tools were built within the housing spaces allotted to them. Jordan mated the whole assembly together and Kevin mated a flap to the head which paved the way for Jordan to finish the assembly of the rest of the flaps along with the other parts in the head.

Mating everything together was the most challenging part of the project. Mating the core body pieces were pretty straightforward, where mates such as coincident, concentric, parallel, and limit angle. To make the Legs move together in unison, a side from each leg had a parallel mate. A parallel mate was also used to keep the bottom of the Feet level with each other. The Rocket Boosters were mated next; they were attached to a backplate to ease the main assembling process, so distance mates were used. Next, the Retractable Leg was mated to the bottom of the body with the aid of distance, limit distance, and parallel mates. The tough part was attaching all the tools to R2-D2's body. All the body tools had to rotate out, so connection parts and axles had to be made for both the tools and body. These tools are the Buzzsaw, Utility Arm, Multi-Function Arm, and Spacecraft Control Arms. All these parts were mated using the concentric, coincident, and limit angle mates. The two sliding body flaps were then attached using tangent and limit angle. As the body was being mated together, all parts attached to the head were being mated separately. The Head was the trickiest assembly to mate together due to the head's geometry. After lots of trial and error, Kevin mated a flap together so that they could

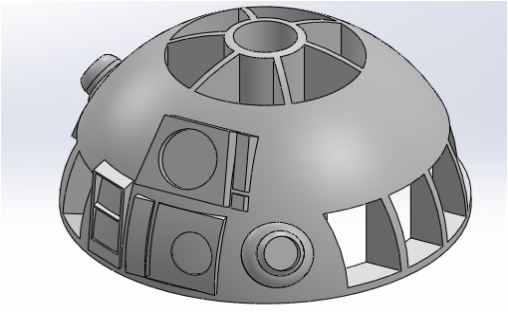
fold up and down using the coincident and limit angle mates then Jordan finished the head flap construction. The parts that attach to the head are the Periscope, Fire Extinguisher, Luke's Lightsaber, Communication Sensor, Inflight Maintenance Arm, and Drink Serving Arm. The mates used to attach the parts were distance, limit distance, coincident, tangent, and limit angle.

In regards to the actual sizes of the parts, many of them had to be resized due to inaccurate measurements. We had to guess the sizes of the tools because those dimensions were not given. Many parts had to be resized using the scale tool.

As mentioned above, all coloring was done by Jordan as well as the Body, Legs, and Feet detailing. Kevin did all the Head detailing.

Challenges

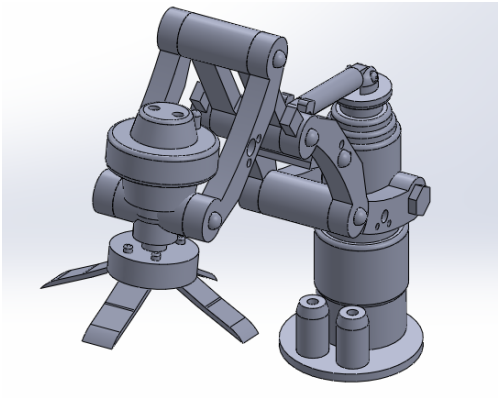
Kevin Medici:



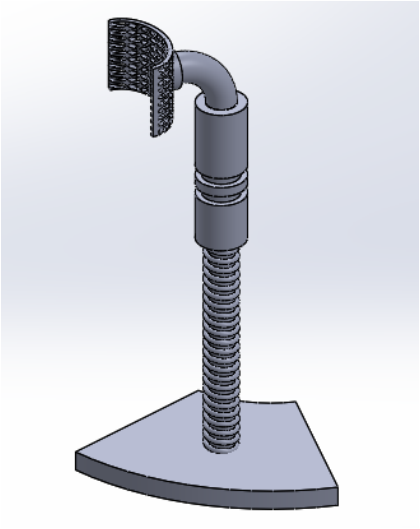
R2-D2's Head

__The head was very tedious because of its round shape. There had to be multiple planes formed on the surface of the head in order to make the extruded cuts for the flaps. There were also planes being made for extruding the projectors and sensors.

Drink Serving Arm



_____The biggest challenge with the drink serving arm was the sizing up the parts to be proportional to each other. There were a lot of bolts that I had to consider in order to mate the whole object.

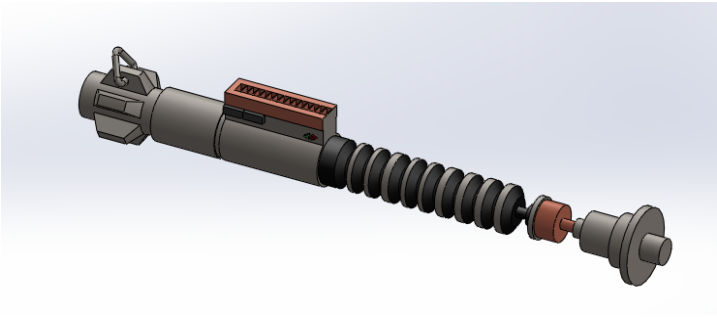


Communication Sensor

No Challenge

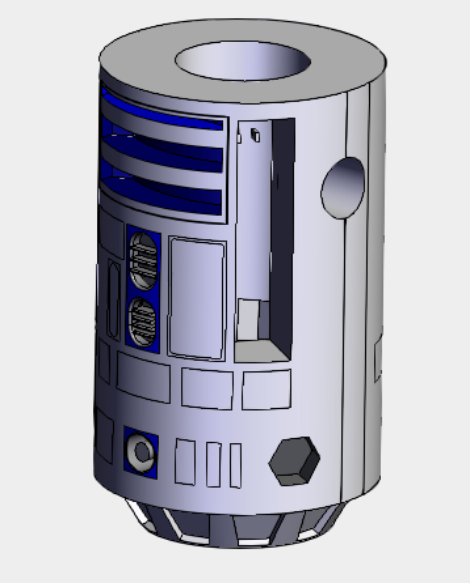
Luke's Lightsaber

The lightsaber was challenging because we had to size it up to make it fit within one of R2's head flaps.



Zhaolun Ding:

Cylindrical Body



In order to make it more authentic, the decoration of the surface is necessary, but I was having a hard time constructing the decorating section line. I previously thought I should create extruded cuts and then fill with extruded bosses, which left the line to be visible. But then I learned a much better technique from Jordan who helped me create the split line and made multiple adjustments, which indeed relieved my stress and broadened my horizon.

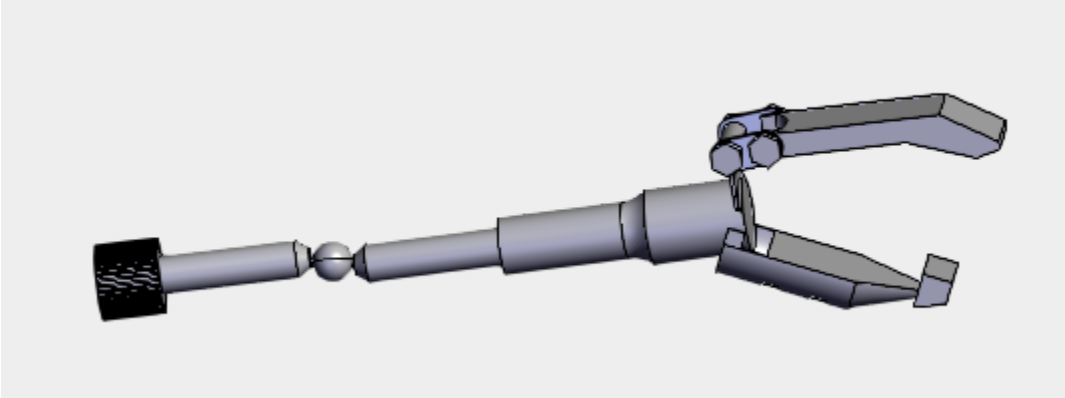
Multi-Function Arm

The only challenge that I encountered when I was building the multi-function utility and interface arm was the construction of horn-shape projection at the top. I was first confused by its shape as it is irregular with size and directional difference between the top surface and bottom surface. I started with the sweep

feature but failed, until I learned again about the loft feature which allows me to create the shape that I wanted just by adding guide curves that I always ignored. After 3D sketching the guide curve and creating two separate sketch planes for top and bottom surface, I was able to finish the part with the current view.

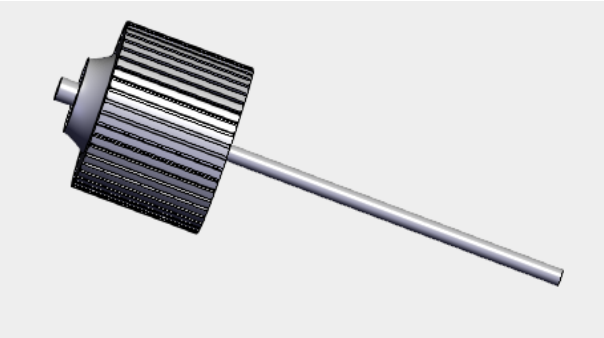
Inflight Control Arm

The challenge of creating the inflight maintenance grasper arm was the connection mates during assembly. Though each part was easy to model, I had to seperate the whole arm into more than 10 parts in order to ensure its flexibility of movement. It is important to maintain its ability to move in different angles while not blocking other parts' movement. I created a sphere for its elbow joint and two others on claws which increased my workload during assembly. But after spending days on drawing and modeling, I was glad to reach my primary goal which provides me with previous experiences.



Fire Extinguisher

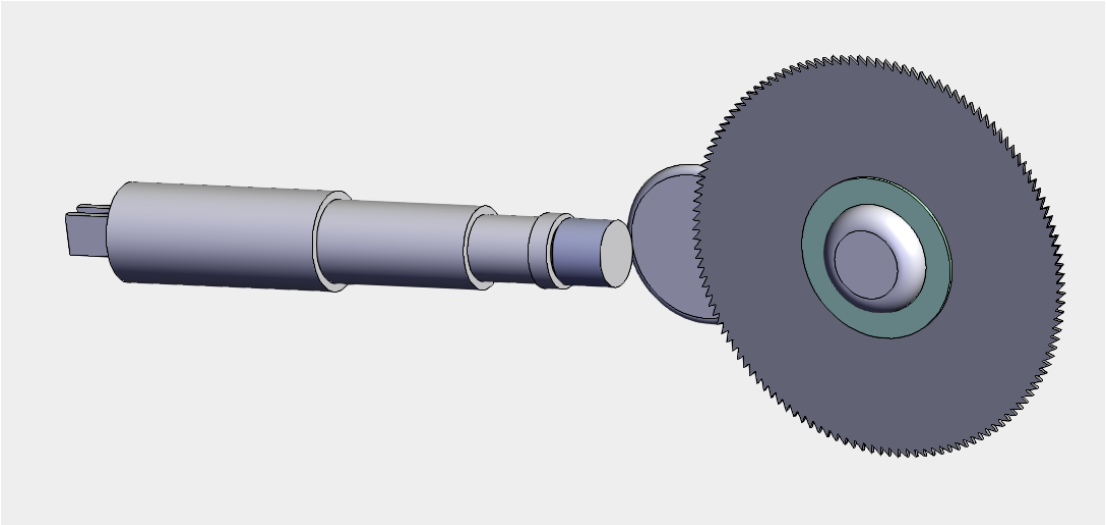
No Challenge.



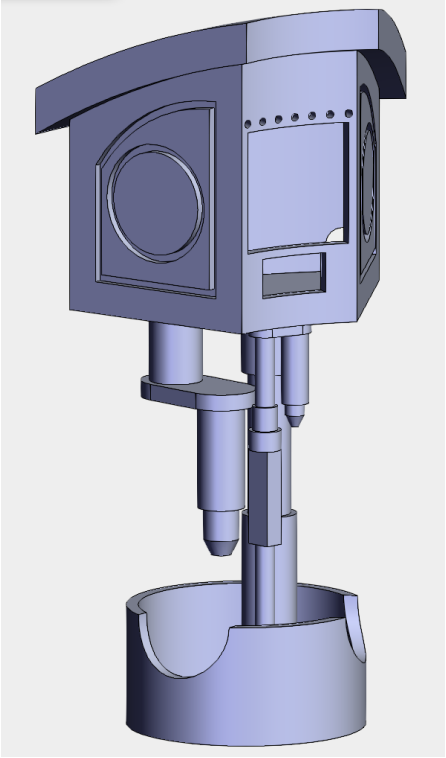
Julian Lopez:

Buzzsaw

No challenge



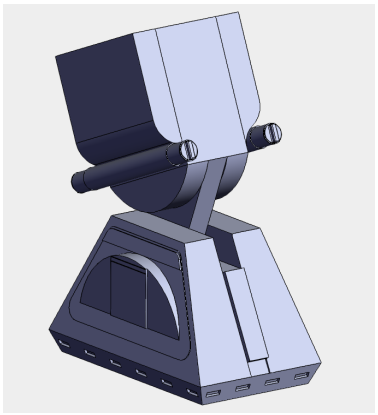
Periscope



The periscope was perhaps the most difficult part to make for me as there were many challenges that went into making the overall part. I had to ensure that the top of the periscope was the exact same dimensions as the hole cut out on top of R2's head while also being able to seamlessly fit into the spherical shape of its head. To do this I recreated the R2 head and sketched the shape of the hole in R2's head and then used an extruded cut to the surface of the R2 head to form the base model of the periscope. The other challenge came when I had to extrude cut hole designs into the curved face of the periscope sides since it wasn't an actual surface I

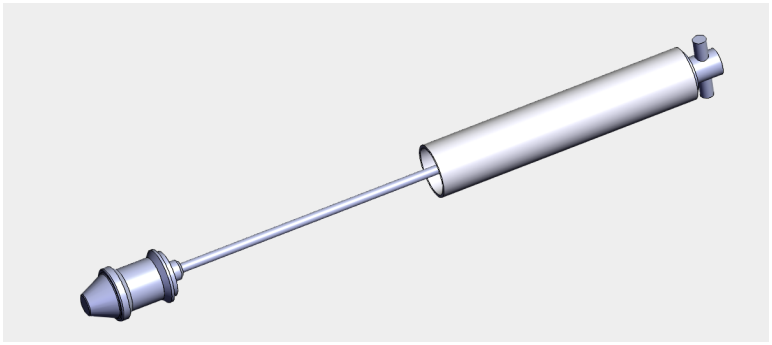
could sketch on. In order to do this, I had to create planes that I were parallel to the curved surface, which was a challenge on its own, and then extrude cut holes on the plane to reach the surface of the periscope

Retractable Leg



The main challenge in creating the retractable leg was to correctly dimension the leg to be the exact size of the other two legs except proportioned smaller to fit the correct size of R2.

Utility Arm

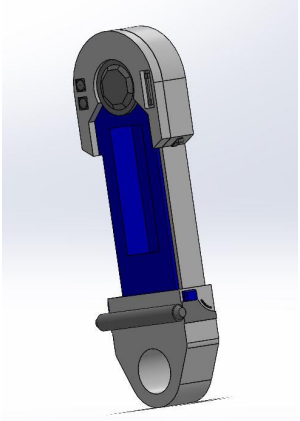


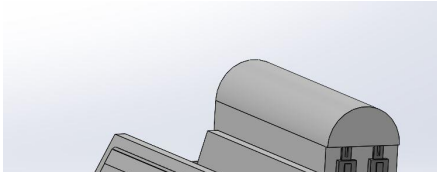
The only challenge that I encountered when creating the Utility Arm was the assembly to have it retract in on itself so it could close and fit into the compartment in R2's body. I didn't know how to do this at first until I found a video on Youtube talking about advanced mates and distance mates, which I then used to have it retract back and forth so it could be fully functional.

Jordan Hall

Legs

No challenge.

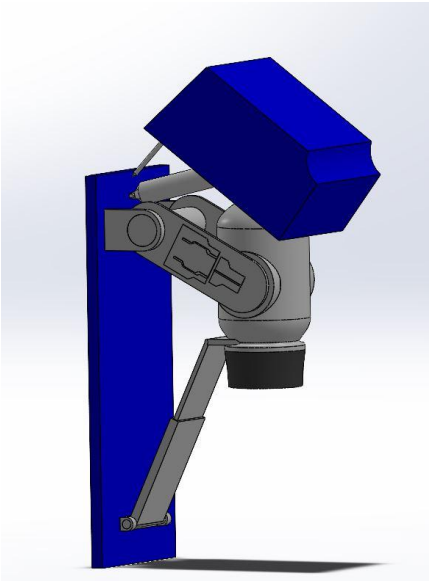




Feet

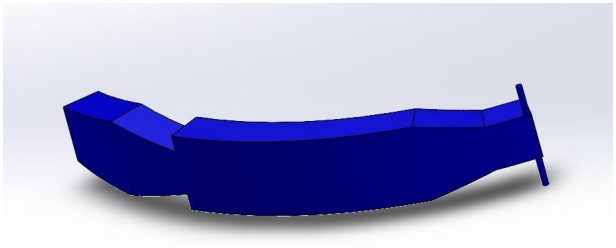
Most of the assembly for the foot was very straightforward. However, creating the curved wires in 3D was a little tough. To overcome the difficulty, two curves were made in two of the planes and a 3D projected curve was used. To make the outer shell of the wires, the swept boss/base feature was used.

Rocket Boosters



This was the most challenging part I was assigned. The Rocket Booster subassembly ended consisting of 18 unique parts and 19 parts in total. The specific set of motion desired was for the rocket to swing completely out of the leg, which was mostly achieved. In addition, there is a cover on top of the rocket that had to move along top of the rocket. Mating the subassembly together was also very challenging and time consuming due to the intricate nature of the mates. Also, part sizes widely ranged in sizes, from a couple of millimeters in length to over 100 millimeters.

Spacecraft Control Arms



No challenge.

Cylindrical Body

To be clear, Zhaolun made the main extrusions on the Body and I did the decoration lines. The decoration lines were a little problematic at first but I ended up drawing the sketches on a plane and projecting the sketches onto the surface.

Improvements

Kevin Medici:

R2-D2's Head

We could improve this part by having all of the flap cuts in line completely. The diameter of the head could have been bigger along with the body because the legs are a little bit disproportional.

Drink Serving Arm

The claws on the drink serving arm should be adjustable in order to actually pick up drinks like in the movies. There are some interferences which could be dealt with by more advanced techniques to move the object.

Communication Sensor

The communication sensor could improve by having the cuts be more proportional on the curved surface for the moving sensor.

Luke's Lightsaber

One improvement for the lightsaber is to have it be a little bit bigger along with all of the project because there were a bit of some scaling issues, yet we resolved them alright.

Zhaolun Ding:

Cylindrical Body

The body dimension at first was disproportionate during the early phase, and we all had to make changes when building the part, the time lost could have been saved by creating more experimental models, but I didn't realize it until I had already spent a lot of time on its details. Thus, my organization and planning skills should be improved. In addition, there are a few decorations that were unable to construct due to the limitations of time and ability, such as the coin slots and the vent fan. The part can be improved by adding these details to make it more authentic.

Multi-Function Arm

The structure of a multi-function arm is simple, and the possible improvement I can think of is to add more decorating curves, though I had to add enough decorations but the film version is more beautiful than the rough version of mine.

Inflight Control Arm

The inflight control arm is imperfect for some small flaws. When I was doing the assembly, I was too focused on the movement space that I didn't set the restriction on the specific movements of parts to prevent the intersecting from happening. To make it more perfect, I should add more options for the mates.

Fire Extinguisher

During the planning phase, I was planning to create an embedded structure for the supporting cylinder, which contains a smaller cylinder that connects to the head of the top and can partly stretch out. Though I made the draft and prepared to work on it, thereafter I realized that it was harder than I thought. So I had to revise my draft and create a simple version of it with fewer components. But I would like to improve it if possible.

Julian Lopez:

Buzzsaw

An improvement that could be made for the utility saw is to add more dynamic movement to not only extend outwards, but to also rotate at an angle so it could match the movement of it as seen in the movie.

Periscope

To have the periscope be more realistic to the actual model, an improvement could be made to rotate the top body of the periscope in a sweeping motion in the assembly to mimic the scanning motion it has. I couldn't figure out how to have it be constrained in the assembly, so this is one improvement I would want to learn more about.

Retractable Leg

In the movie, the R2 model has treads on the bottom of the feet of each leg to move around, similar to that of tank treads. While this aspect wasn't added in our model we made, I would like to improve on this and add the treads to the bottom of the feet as well.

Utility Arm

The utility arm is relatively simple so it would be hard to add any improvements to it, but one improvement would be to add a more decorative design in adding color patterns to the case of the arm so it could match the white and blue color scheme of R2

Jordan Hall

Legs

The legs ended up being too big in comparison to the rest of R2-D2, and the scale feature was not the correct tool to use to fix it. However, we made it work by scaling other parts. Another improvement would be to shift up the bottom horizontal cylinder to avoid it colliding with the foot.

Feet

The boxes on the side of R2-D2's foot are a little too tall and collide with the main body. In the future, these boxes could be shortened to avoid collision.

Rocket Boosters

The Rocket Boosters were a little too small in comparison to the legs. It would have been really tough to scale every component of the rocket so it was left the way it was. Also, the parts connecting the rocket cylinder to the backplate could have been a little longer.

Spacecraft Control Arms

I am actually very satisfied with the Spacecraft Control Arms and the only improvement I would make is adding more detail.

Cylindrical Body

Due to the cylindrical shape of the body, it was very difficult to add 3D decorative extrusions. In the future, more of these extrusions would be a nice touch.

Project Summary

Kevin Medici:

R2-D2's Head

R2 D2's Head is the part where it senses everything and has various tools come out of its flaps. The parts that emerge from it are: the Periscope, lightsaber, communication sensor, fire extinguisher, drink serving arm, and inflight arm. The part is made of carbon steel.

Drink Serving Arm

The Drink Serving Arm in the movie is an arm that is detachable from the head. It's used for special occasions because serving drinks is not the droid's main function. The arm can move in different directions with it's 19 parts.

Communication Sensor

The communication sensor pops out of R2's head via magnets placed in the head. The sensor spins in order to see if there are any lifeforms in all directions at R2's reference point.

Luke's Lightsaber

Luke's lightsaber has some buttons which turn on and off the plasma generated from an internal power source. It is inside of R2's head in order to eject it to it's master when he is in danger.

Zhaolun Ding:

Cylindrical Body

The cylindrical body part is the main part of the body that connects between the head with legs, and also carries the arms attached to the body including the multi-function utility and buzzsaw and so on.

Multi-Function Arm

The multifunction arm lies in the front side of the body with the ability of rotating within about 90 degrees.

Inflight Control Arm

_____The inflight control arm was designed with great flexibility of movement and should be able to move identically with human hands. The claw is enabled to open and close to hold and move objects.

Fire Extinguisher

The fire extinguisher is a small apparatus with restricted linear motions, and most of time lies in the head. It can be stretched out of the head with limited distance and rotate within the center. In the film, it is a can filled with compressed air.

Julian Lopez:

Buzzsaw

R2 utilized the buzzsaw to get out of hazardous situations, which is how it was debuted by him using it to cut his way out of a net trap that was thrust upon him. Because of this, our R2 model wouldn't be complete without his buzzsaw in the case that a net traps him and he needs a way out.

Periscope

The periscope is possibly considered to be an iconic part of R2D2 because of how recognizable and unique it is. Whenever he is tasked with scanning the environment and searching for anything in it, his periscope is utilized and comes out of the top of the head, which is extremely hard to miss.

Retractable Leg

When R2D2 isn't moving, he remains still on his two main legs attached to his body, but when he wants to get somewhere, he deploys his retractable leg to move quickly and efficiently.

Utility Arm

R2D2's utility arm is used to connect to computer interfaces, which is extremely vital when it relates to R2 since his main advantage is being able to access any system he comes across.

Jordan Hall

Legs

The Legs are the parts that connect R2-D2's feet to the main body. The Legs are able to rotate about the main body to account for R2-D2's standing state and moving state. They also hold the Rocket Boosters.

Feet

The Feet are what stabilizes R2-D2 when standing or moving. The feet are connected to the bottom of the leg and can rotate so that they are always parallel to the ground.

Rocket Boosters

Tucked inside the Legs, the Rocket Boosters allow R2-D2 to maintain short periods of flight. This can be to either jump over an obstacle or to slow a descent.

Spacecraft Control Arms

One of R2-D2's main functions is to aid a pilot when flying a space fighter. To do this, two Spacecraft Control Arms are able to swing out and connect to a ship's connection ports. These parts are located in the upper front of the Body.

Modeling Process

Kevin Medici:

R2-D2's Head

The Processes Revolve Boss/Base, Extrude Boss/Base, Extrude Cut, and Fillet were used to create R2's head. Sketching a quarter circle to a radius which is supposed to be half the diameter for the horizontal and vertical directions and revolving the base around the centerline. This is so that the head can fit onto the body. There were multiple reference planes created on the curved surface where there were extruded cuts so that the internal parts mentioned earlier can emerge from the interior of R2. There were also many extruded bosses/bases in order to make the kerner optical holographic projector, process state indicator, primary photoreceptor and radar eye, and the logic function displays.

Drink Serving Arm

The drink serving Arm consists of 19 parts where I made multiple circular Extruded Boss/Bass for the base of the arm then I made many extruded cuts. There were many fillets on the base of the arm. There were a lot of curved parts to it which were replicated because of the

symmetry of the object. I made six bolts to keep the drink serving arm from rotating in a different direction. The claw had to have the loft feature be used in order to make it at an angle to the top of the claw. There was also a circular pattern used to make it so they are equal distance away from each other making it efficient for picking up drinks. Fillets were used because of the detail in the part.

Communication Sensor

This piece had five parts to it where I had to make an oval and extrude it down then make a bunch of pill shaped profiles using the linear pattern then extruding the cut. I then made a circle and used the helix/spinal function to make the wire sketch profile. Then I sketched a circle of some diameter big and sweeped it along that spiral profile. I extruded the rod for it and then mated all the components.

Luke's Lightsaber

In this piece I used the revolve boss/base for this piece along with many linear patterns. The ring was sweeped in order for the lightsaber to be attached to Luke's waist. There were many boss/base extrusions in the lightsaber for the buttons and for grip.

Zhaolun Ding:

Cylindrical Body

The cylindrical body is modeled by first creating the extruded boss of a circle to reach the shape of the cylinder, and then creating a sketch plane at the bottom for the loft to create the skirt. On the skirt, create a sketch plane that coincides with the side surface of the loft and then

construct a trapezoid shape extruded cut with replication using circular pattern around the center. After that, create proper sketch planes and make extruded cuts at the front and right plane, create the areas for attached arms and the connection hole for head and legs, create planes to mirror replicated features.

Multi-Function Arm

The multifunction arm was relatively easy to build. I started with its cylindrical body which I separated into two parts as the supporting column and the main body part. I constructed the main body part with a rectangular sketch along with gaps for different layers,then revolved around one of its edges. In addition, there are two parts that are difficult to integratedly construct; therefore, I created them separately applying the similar technique. For the spear shape part, I created an extruded boss on the side that contains a hole to hold it. For the horn shape part, I specifically created a circular extruded cut at the top and a conjugate boss at the bottom of the part. Then, I polished each part by adding decoration like fille or thread. At last ,assemble all the parts to the main body.

Inflight Control Arm

The inflight control arm was accomplished with four main parts and several small components. For the first and second main parts, I applied an extruded boss and loft to attain its cylindrical body, and added a thin cylinder axle for connection. To ensure its flexibility in rotation, I created the connection between them as a sphere being halfly separated and attached to each main part, and integrated by an axle in the middle. Then on the second main part, I created a thin extruded

boss with a hollow cylinder at the top, and a rotatable axle in it. This was to allow the claw to have greater space to move. After I made the ellipse shaped connection part with two holes on it, I connected the body part and the claw. The third main part, as the upper claw, I created it by first sketching its contour at the right side plane and extruding it, then attached two small cylindrical bosses at left and right side. And for the fourth main part, the lower claw, after I have created its half cylindrical body with a similar method, I hollowed it and made two small extended surface areas and connected them with a cylinder axle. Besides, to increase its stability of motion, I created a cap nut to attach them to the each end side of the axle. Lastly, I assembled all of the components and created the final assembly.

Fire Extinguisher

The fire extinguisher was created simply by firstly applying an extruded boss for circular sketch to make the cylinder shape, and then made extruded cuts on its curved surface with circular pattern, and created two sketch planes with circles then connected them with loft. In the end, created a through all extruded cut from top to bottom and attached the axle.

Julian Lopez:

Buzzsaw

I started modeling this part by creating the main buzzsaw, which was done by extruding a circular sketch by a thickness of one millimeter and then creating a small triangular sketch on the surface to act as a single tooth of the buzzsaw. I then used the circular pattern feature and created 130 instances around the saw to complete all the teeth of the saw. After I cut a hole in the center so the saw could connect to the handle and started forming the handle with a variety of sketches

and extruding everything until the handle was made. To make it more complete and flush, I added fillet edges to the handle so it could be more smooth and then assembled everything together at the end.

Periscope

After sketching the top of the periscope, I extruded the sketch to the surface top of the R2 head which I added in my sketch as a reference. Once I had that I used offset conversion of entities and extrude base to complete the main body of the periscope and then added planes to cut holes on the walls of the periscope. I then had to hollow out the model as well and used more offset entities and extrusion cuts to get that desired outcome.

Retractable Leg

To create the frame of the leg, I made a rectangular sketch on the top plane and then an offset sketch on a reference plane above the sketch to use the loft feature and get the angled look that the leg frame had. To create the designs around the leg frame, I made reference angles parallel to the face of the leg and sketched patterns on it until I could extrude to the surface of the face of the leg frame. Once all the patterns were done I mirrored all the features on the one side and transferred it to the other to get the complete model.

Utility Arm

The utility arm was a straightforward process which included making circular sketches and using the loft feature to get the funneled look at the tip of the arm. I then used convert entities and

extrusions to form the rest of the model and fillet features to get a more rounded shape for a more smooth design.

Jordan Hall

Legs

To start the Legs, a centerline was drawn and half of the desired shape of the leg was sketched. Then the sketch was mirrored across the centerline and extruded. A hole was hollowed out at the bottom for the foot connection and a cylinder was extruded at the top for the main body connection. Many of the details on the leg were created by sketching on the leg surface and making small extrusions or extrude cuts.

Feet

The base of the Feet was created first, which was a simple rectangle. Then two planes were created above the rectangle: one for the widest part of the foot and one for the top of the foot. Rectangles were created on each of those planes. Once created, the loft feature was used to create the slanted sides of the foot. The large side boxes were made next, which was made by using a reference plane. A rectangle was sketched and extruded, then a half circle was created on the top and bottom of the box to round off the top. After that came the decorating, which involved mostly extrusions. The wires were the toughest part and were made by using two curves and projecting them to create a single curve.

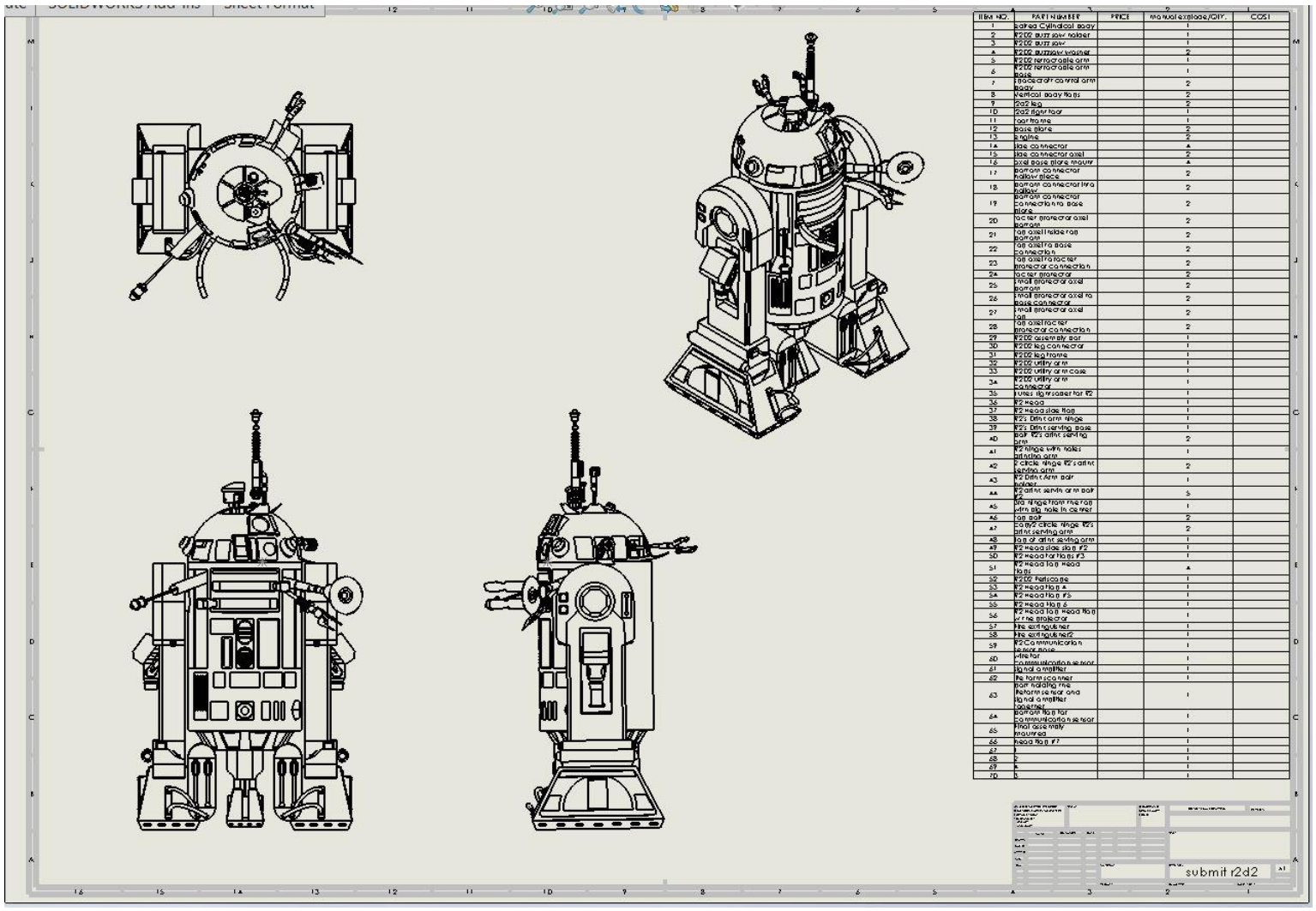
Rocket Boosters

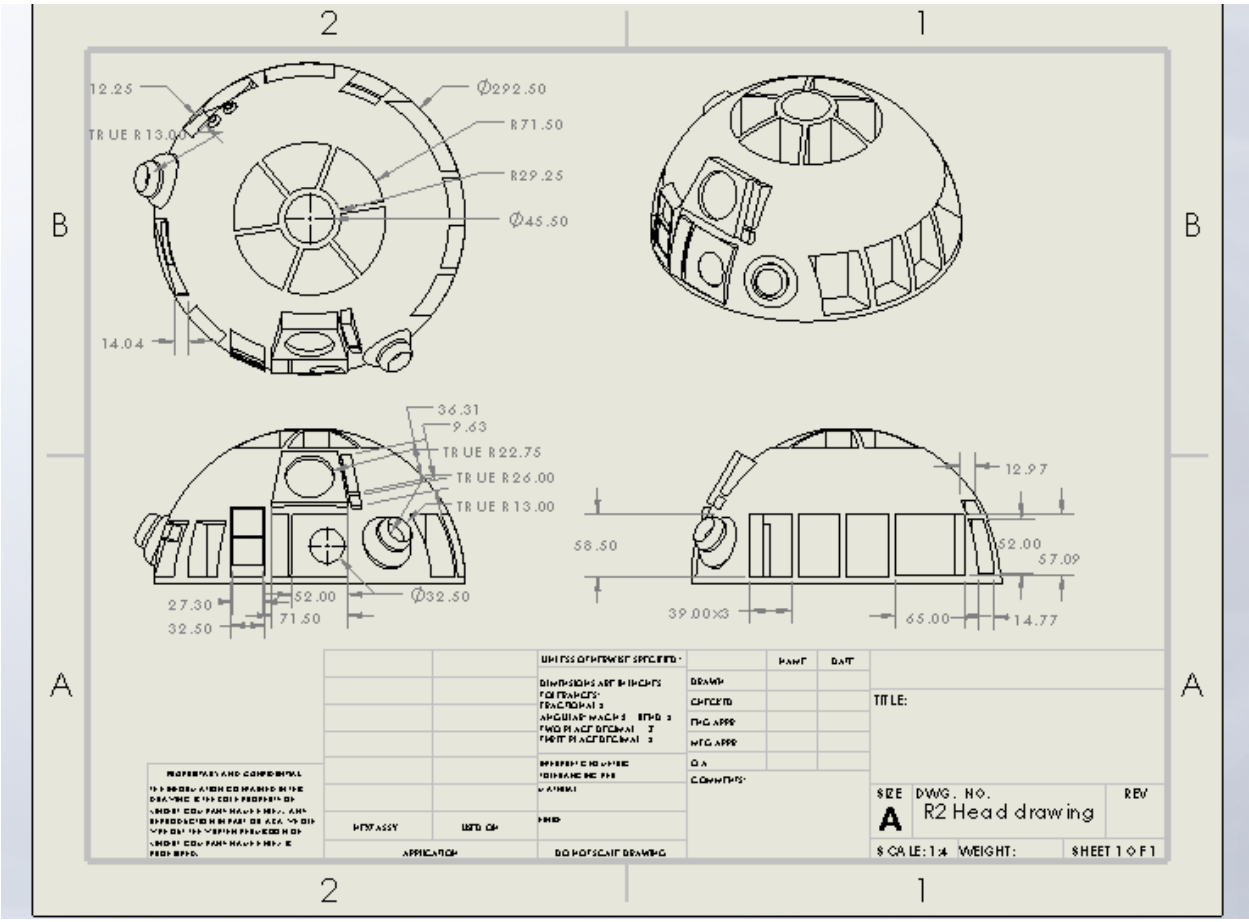
To aid in the creation of the Rocket Boosters, a backplate was created to mount the rocket parts. This was a simple rectangular prism. Separately, each part was made using multiple series of extrude base, revolve base, and extrude cut. Once all the parts were constructed, every connector was mated onto the main rocket body and then each of the connectors were mated onto the backplate. Lots of varieties of mates were used, such as coincident, distance, concentric, limit distance, limit angle, and parallel.

Spacecraft Control Arms

The Spacecraft Control Arms were made in a similar fashion to the Legs, where a centerline was drawn and half of the part was sketched. The mirror function and then the extrude function were used. To bend the control arm, the flex tool was used. Finally, mounting cylinders were extruded onto the pivot point to connect to the main cylindrical body.

Working Drawings

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R2 Head drawing
REV
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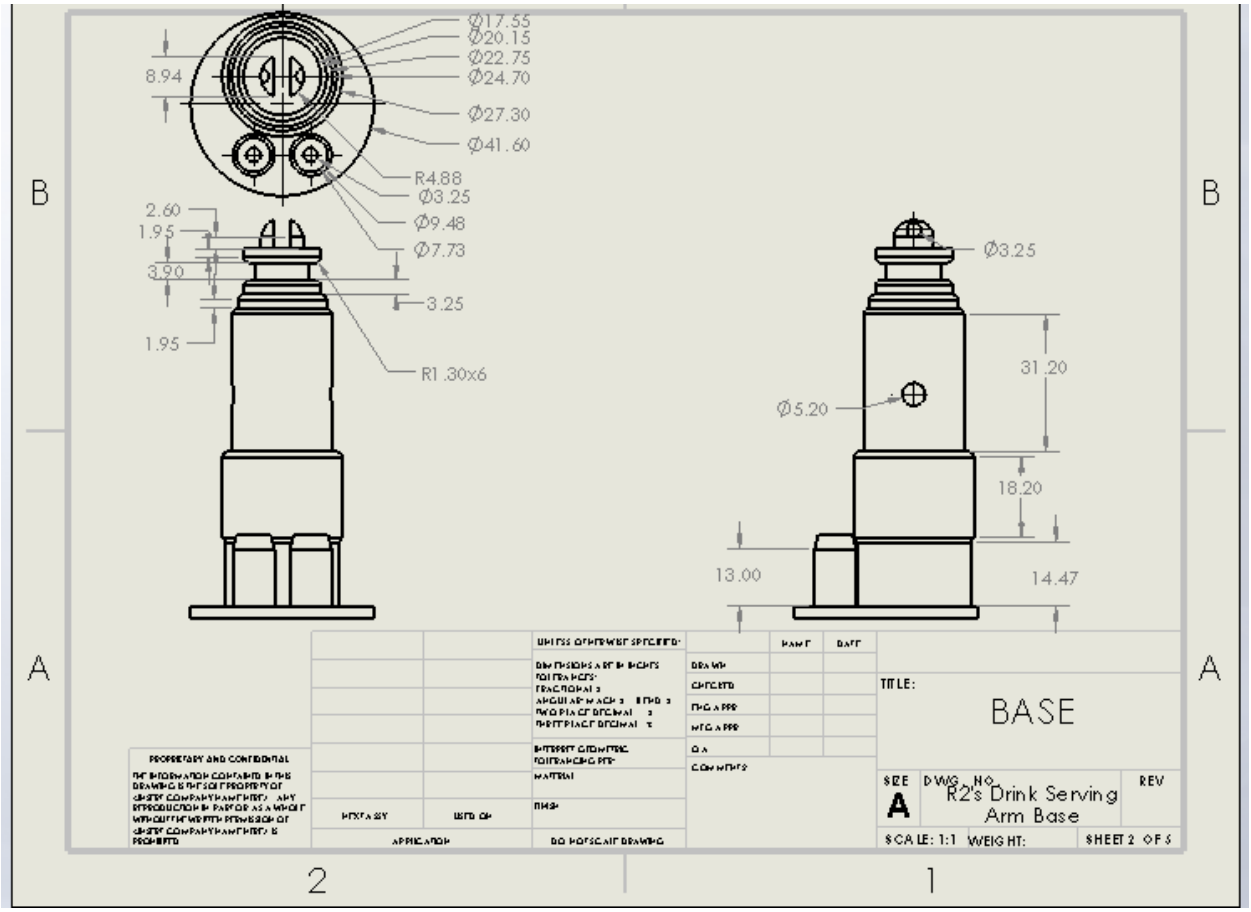
WEIGHT:
SHEET 1 OF 1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2.60
1.95
3.90
3.25
1.95
R1.30x6
Ø3.25
31.20
Ø5.20
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B
A
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REV
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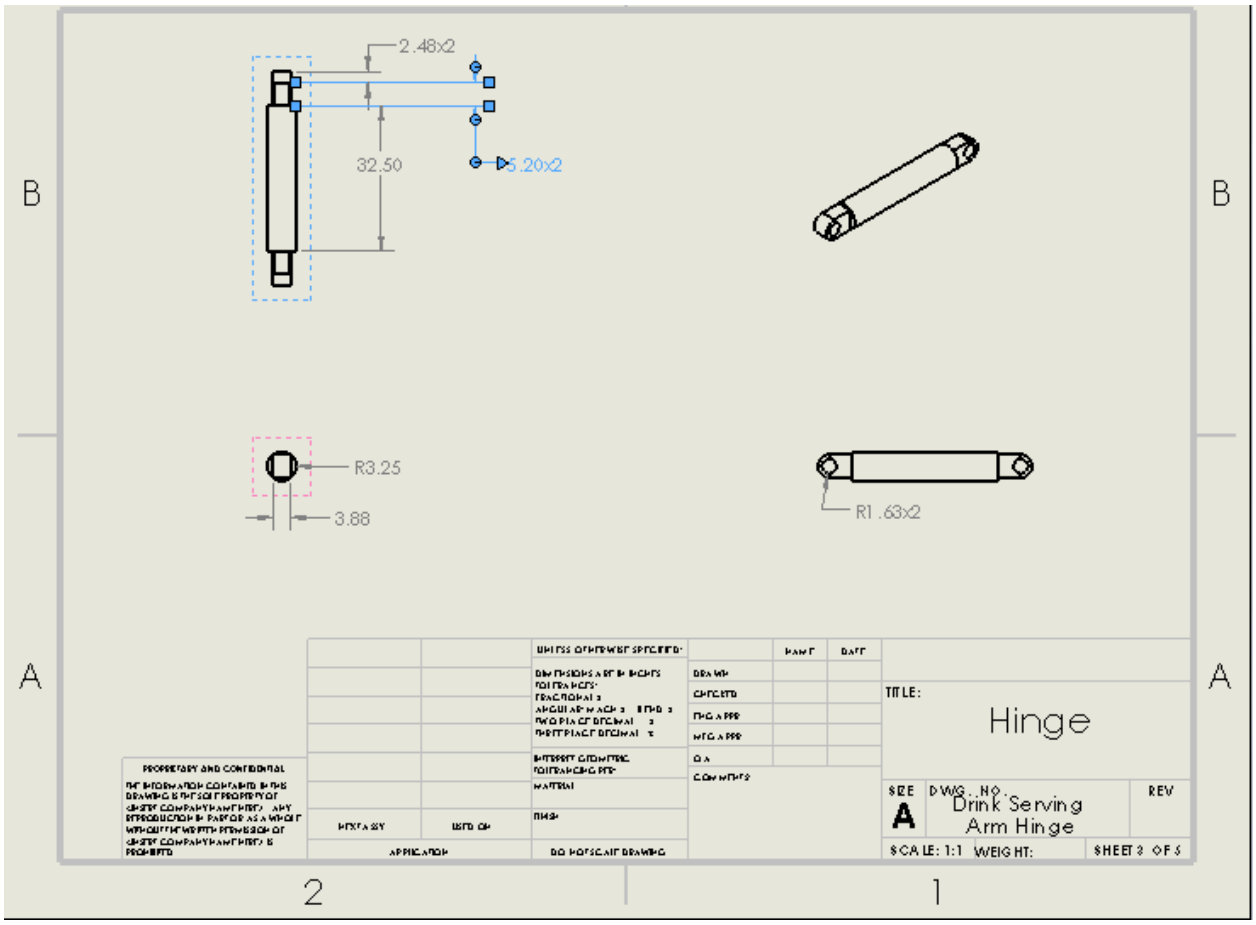
WEIGHT:
SHEET 2 OF 5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Hinge
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SIZE
A
REV
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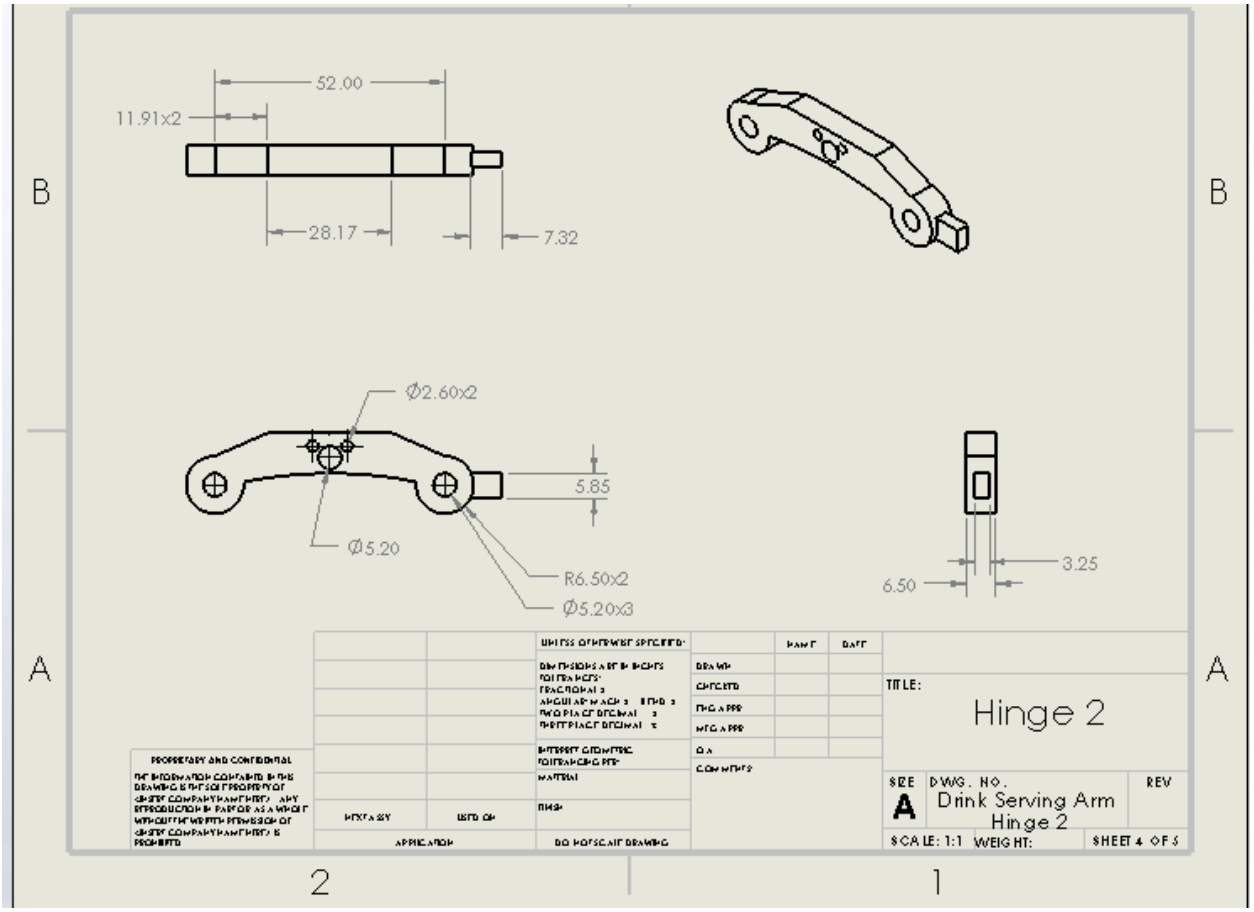
SHEET 3 OF 3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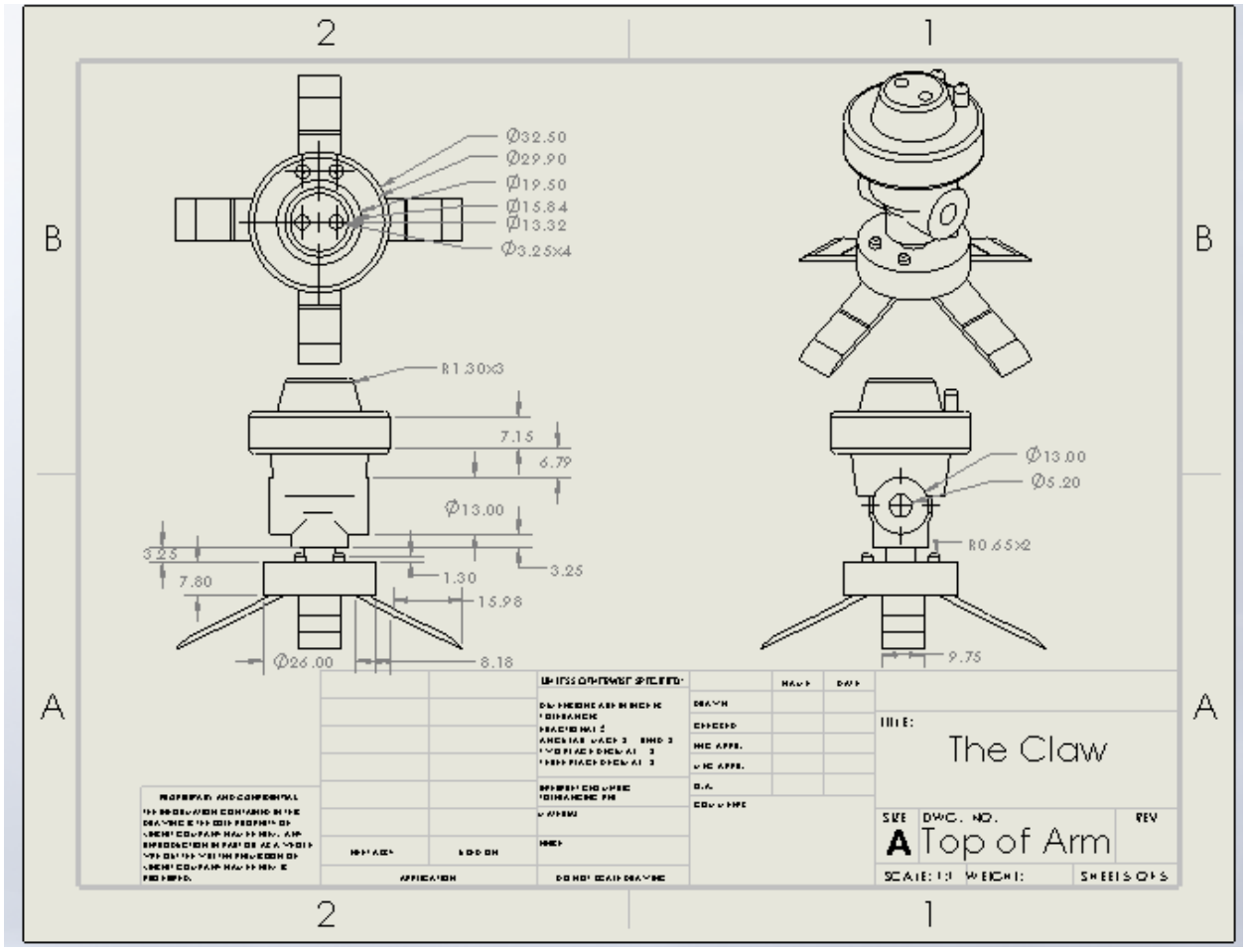
Hinge 2
REV
SCALE: 1:1
WEIGHT:
SHEET 4 OF 5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Ø5.20
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Top of Arm
REV
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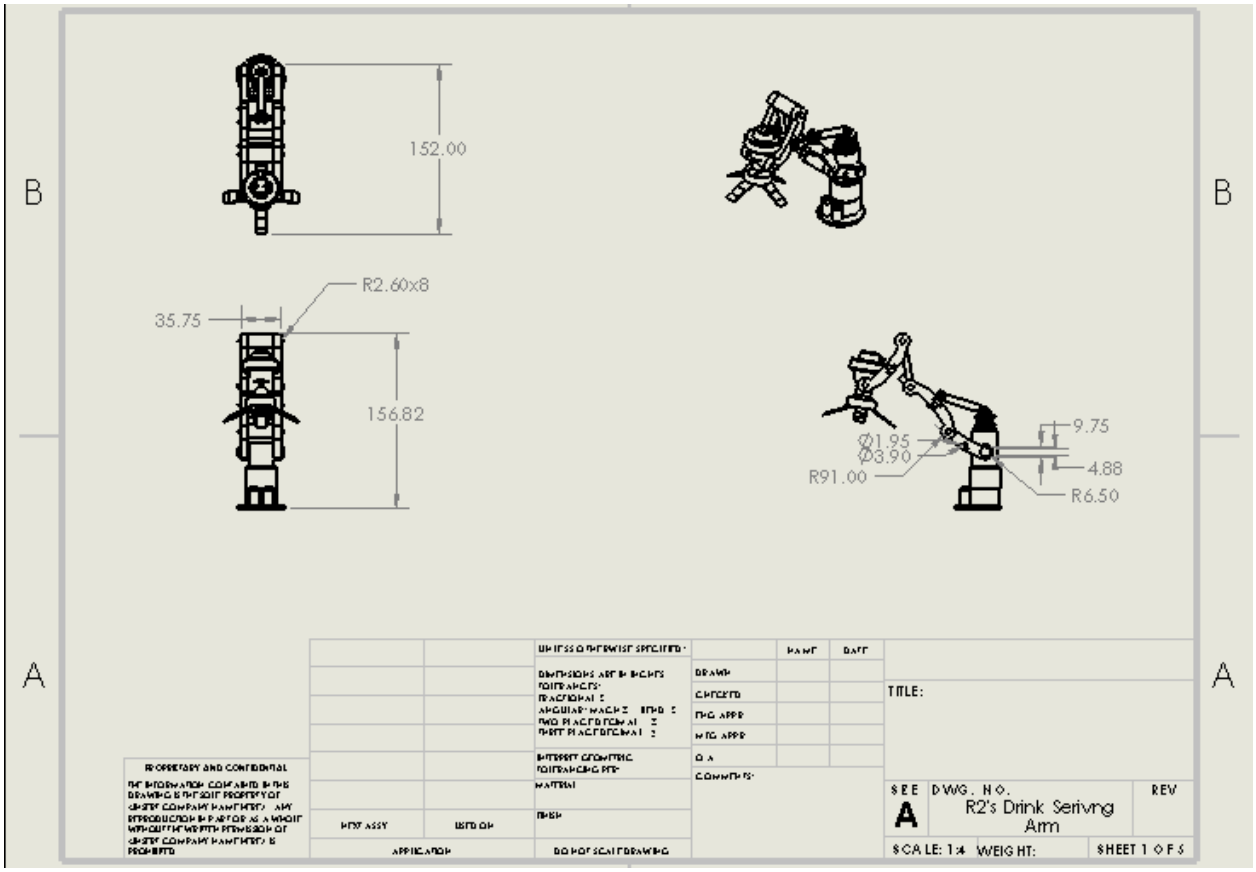
SHEET 1 OF 1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REV
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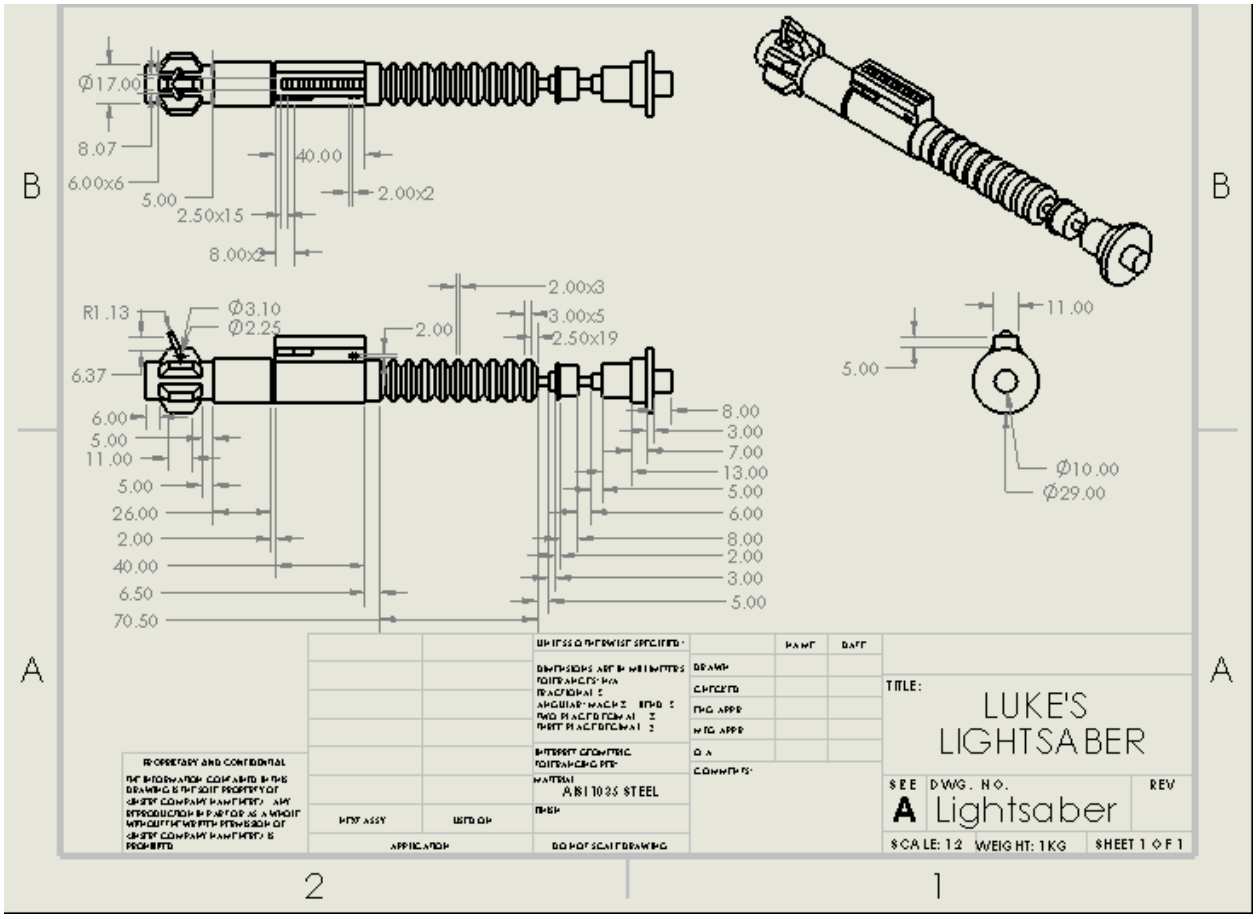
WEIGHT:
SHEET 1 OF 5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2.00
2.00x3
3.00x5
2.50x19
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5.00
11.00
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8.00
2.00
3.00
5.00
11.00
5.00
Ø10.00
Ø29.00
B
A
2
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NAME
DATE
DRAWN
CHECKED
ENG APPR
MFG APPR
Q.A
COMMENTS:
MATERIAL
ABS1035 STEEL
FINISH
NEXT ASSY
USED ON
APPLICATION
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PROPRIETARY AND CONFIDENTIAL
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REV
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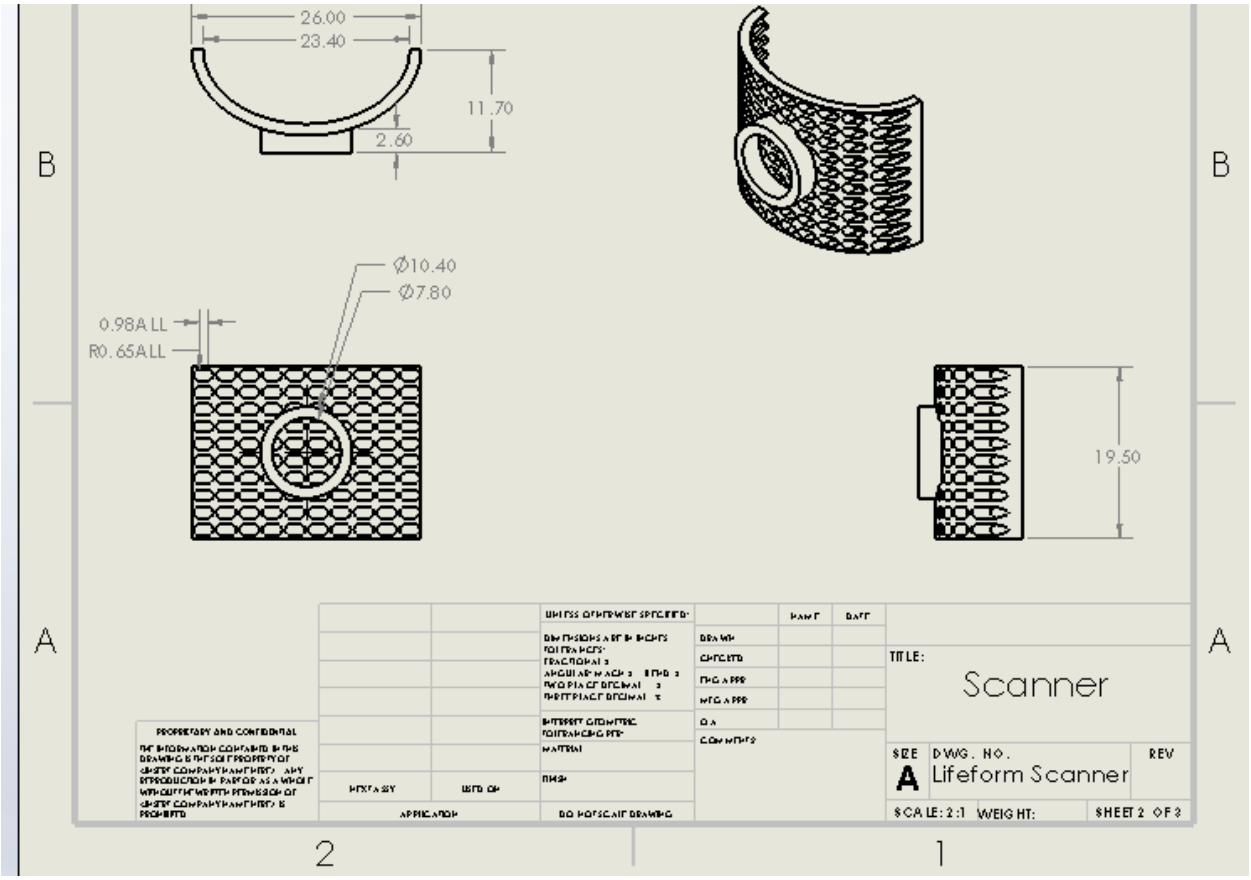
SHEET 1 OF 1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REV
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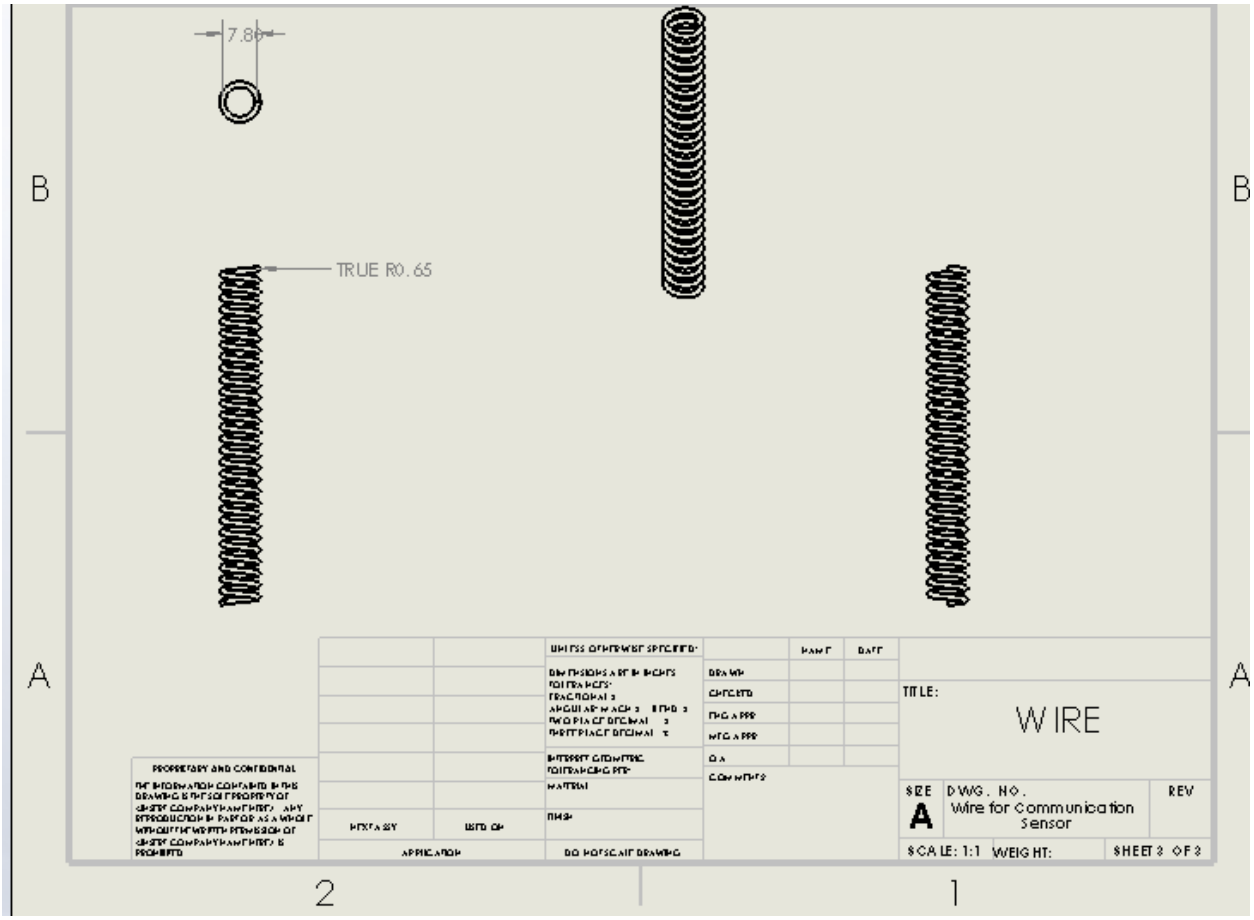
WEIGHT:
SHEET 2 OF 2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Wire for Communication Sensor
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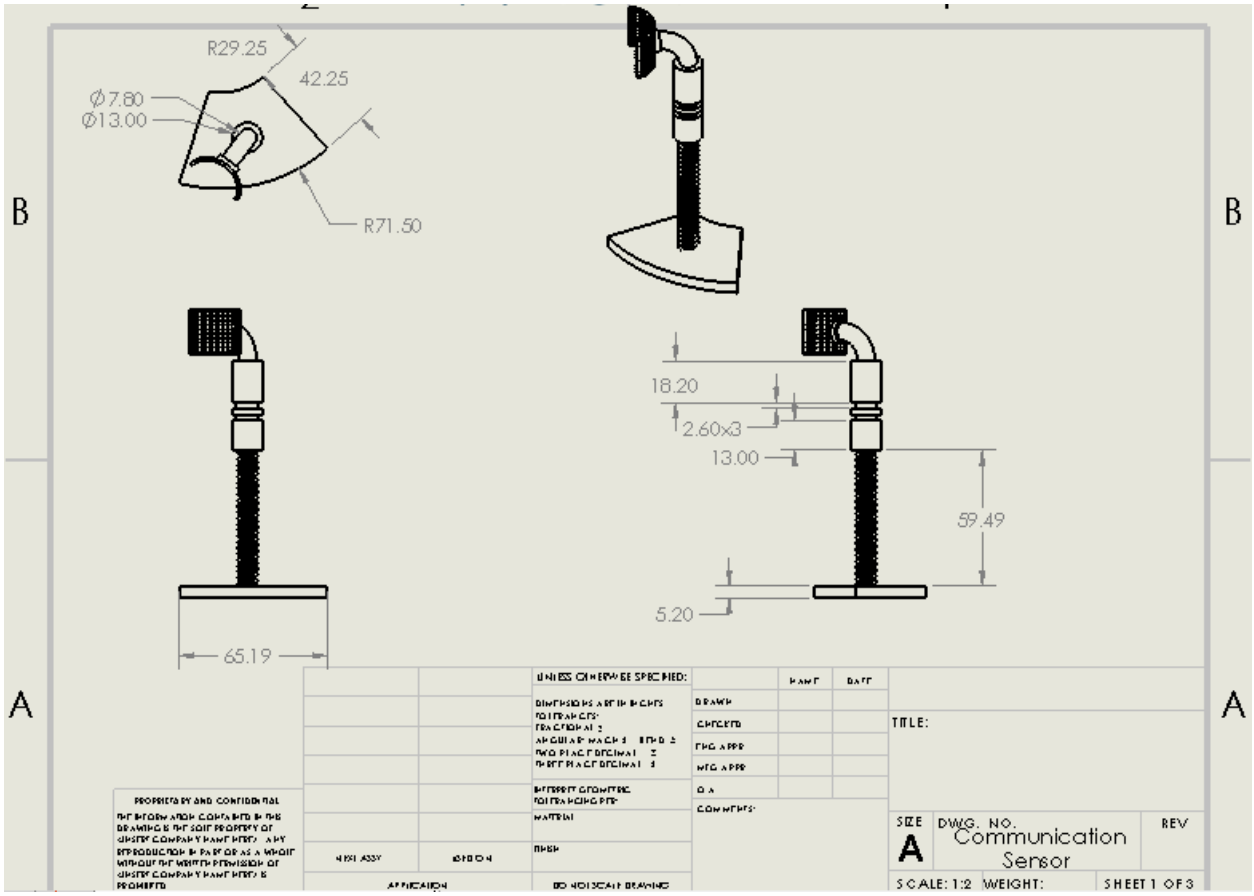
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ENG APPR
MFG APPR
Q.A
COMMENTS:
TITLE:
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NEXT ASSY
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REV
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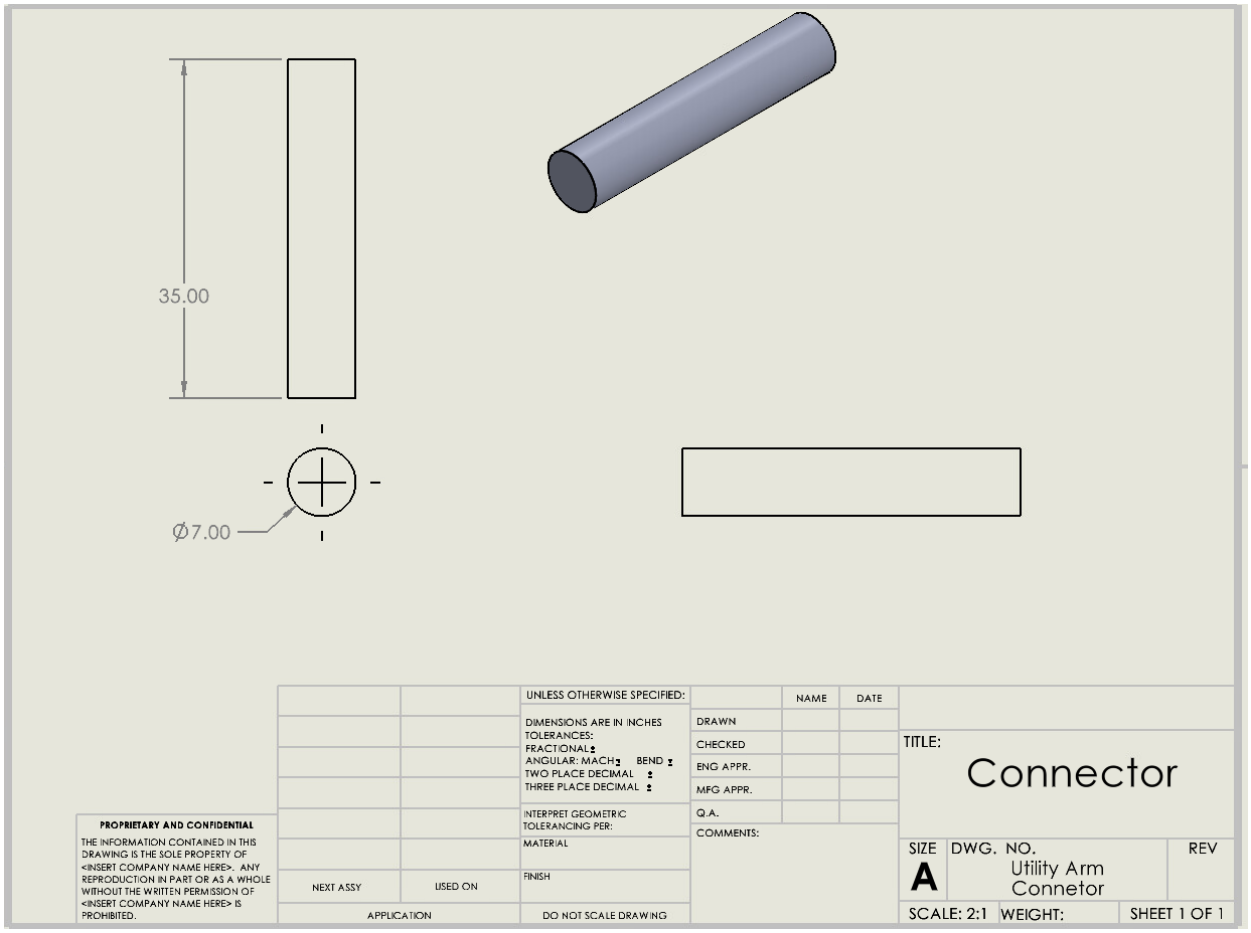
WEIGHT:
SHEET 1 OF 3



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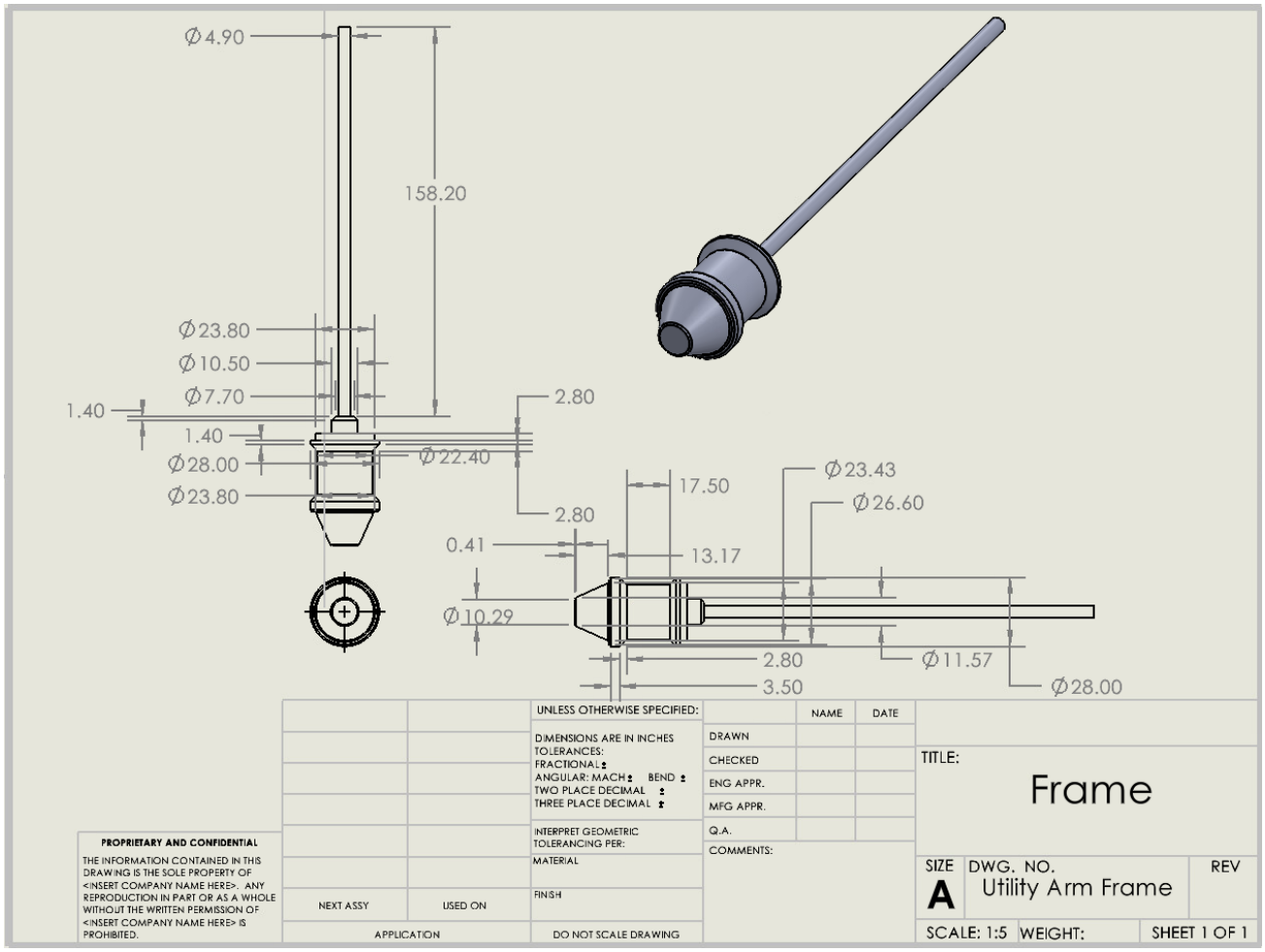
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE: Connector

SIZE	DWG. NO.	REV
A	Utility Arm Connetor	

SCALE: 2:1 | WEIGHT: | SHEET 1 OF 1



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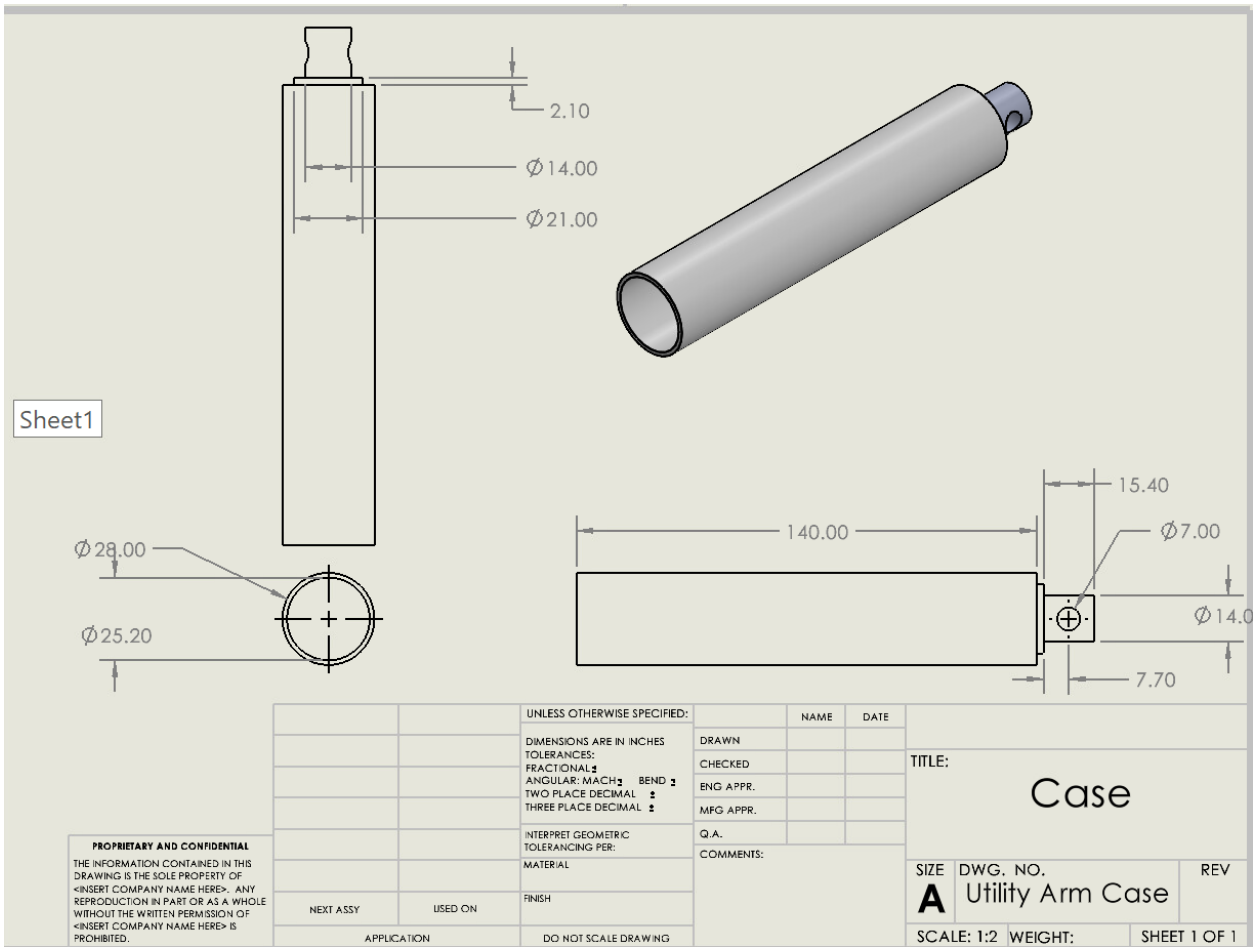
		MATERIAL	COMMENTS:			SIZE A / DWG. NO. Utility Arm Frame / REV
NEXT ASSY	USED ON	FINISH				
APPLICATION		DO NOT SCALE DRAWING				SCALE: 1:5 / WEIGHT: / SHEET 1 OF 1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ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
NEXT ASSY
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APPLICATION
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NAME
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CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
TITLE:
Case
SIZE
A
DWG. NO.
Utility Arm Case
REV
SCALE: 1:2
WEIGHT:
SHEET 1 OF 1
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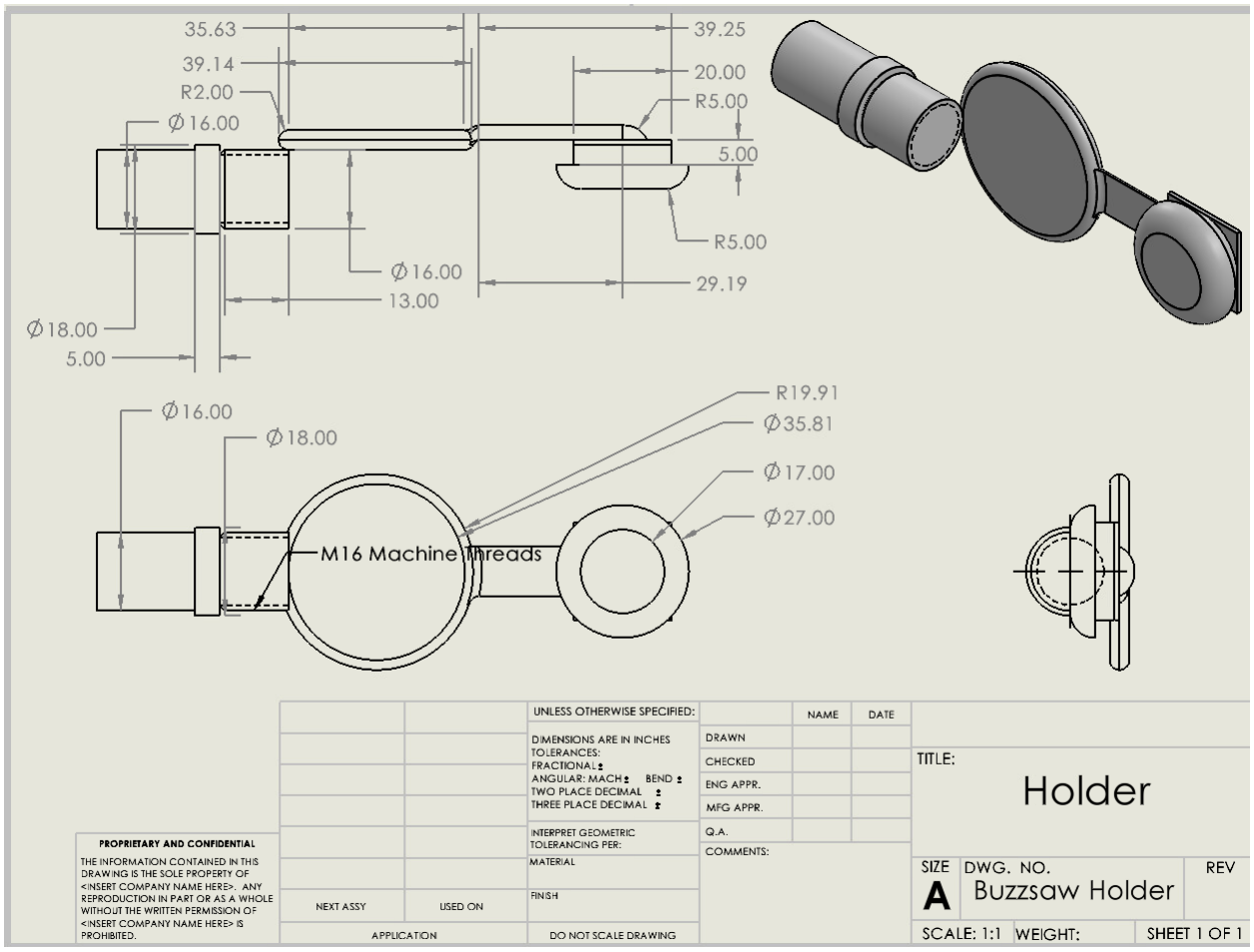

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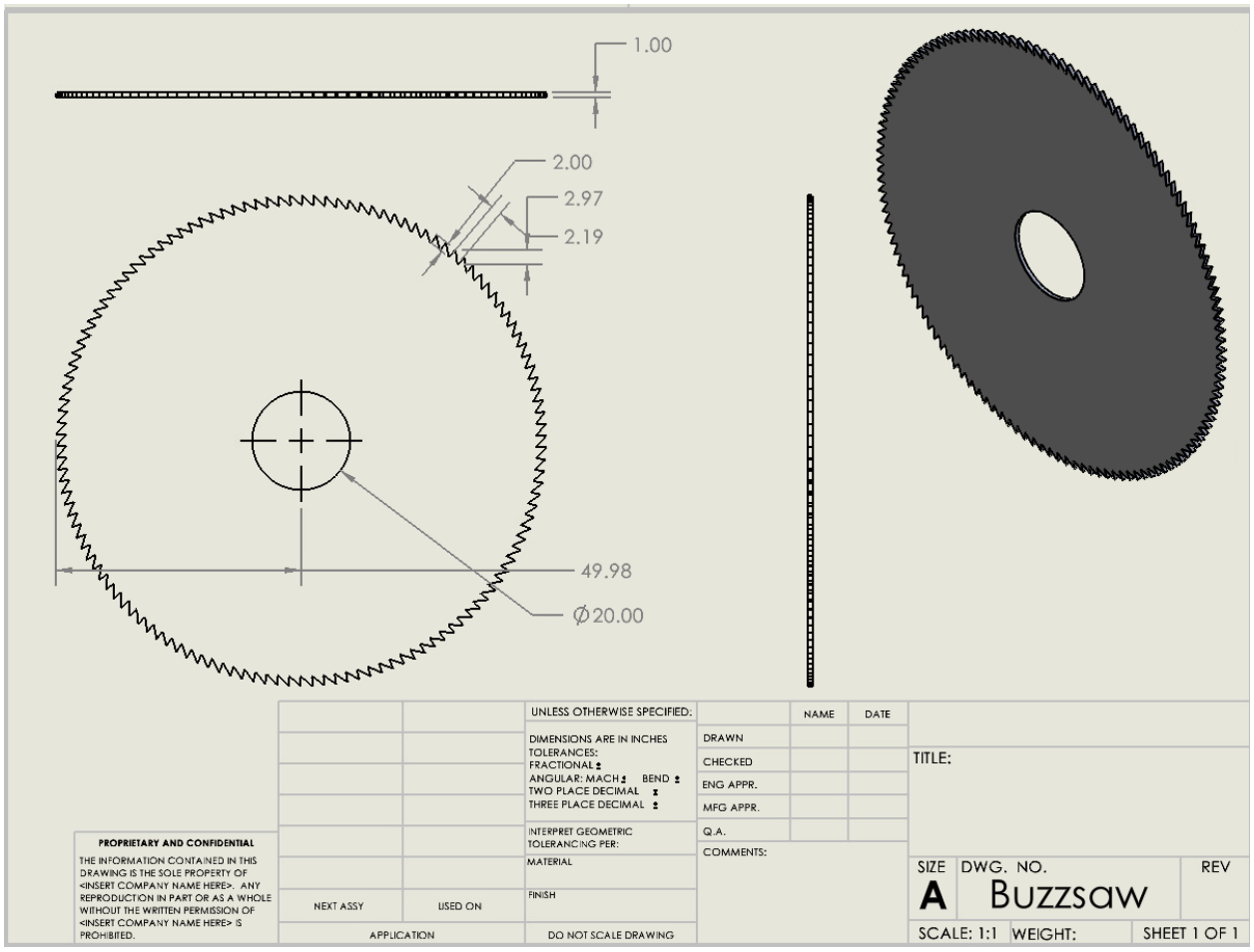
TITLE: Holder

SIZE	DWG. NO.	REV
A	Buzzsaw Holder	
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1



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			MFG APPR.		
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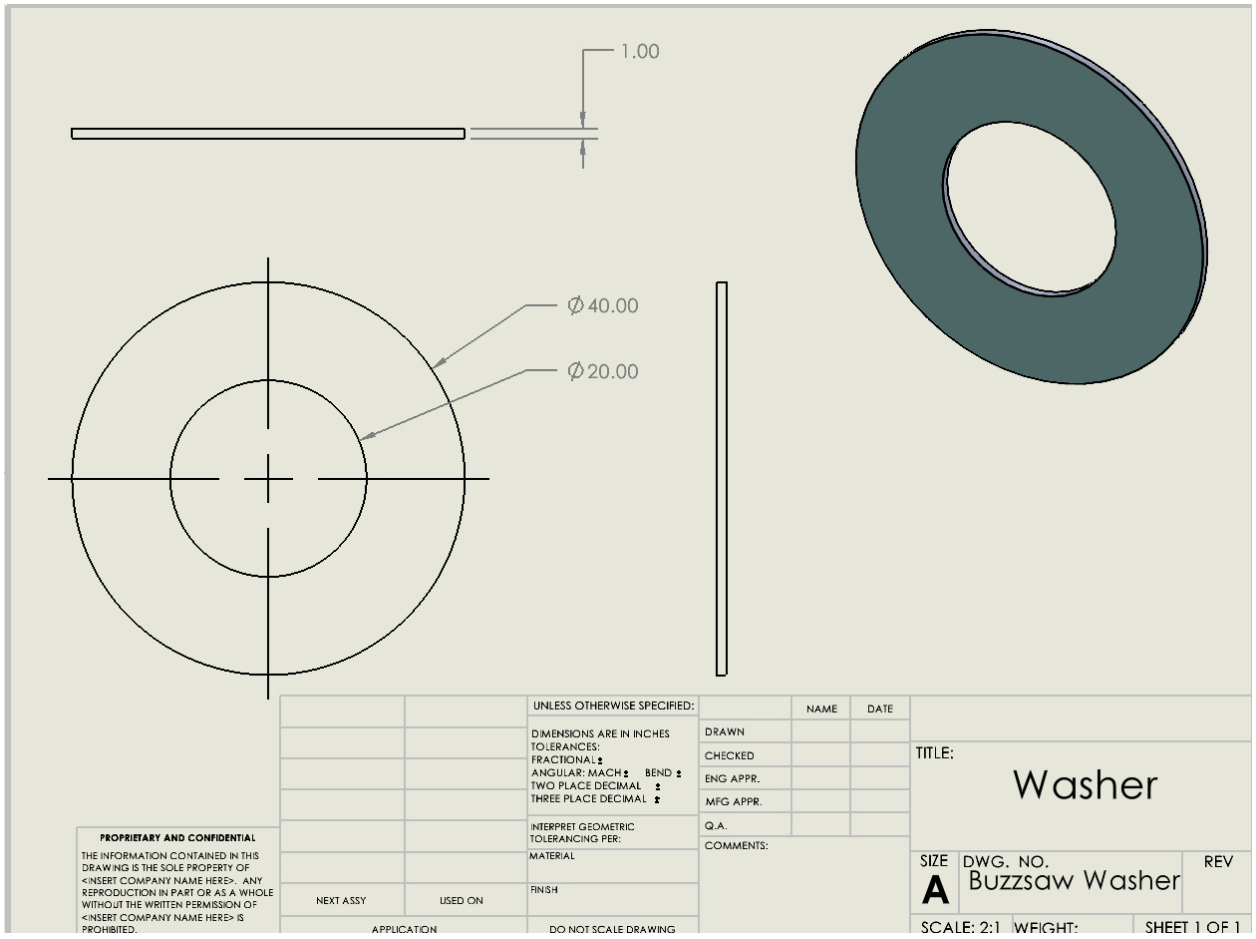
		MATERIAL	COMMENTS:		SIZE: A — DWG. NO.: BUZZSAW — REV:
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			SCALE: 1:1 — WEIGHT: — SHEET 1 OF 1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Washer
SIZE
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DWG. NO.
Buzzsaw Washer
REV
SCALE: 2:1
WEIGHT:
SHEET 1 OF 1
PROPRIETARY AND CONFIDENTIAL
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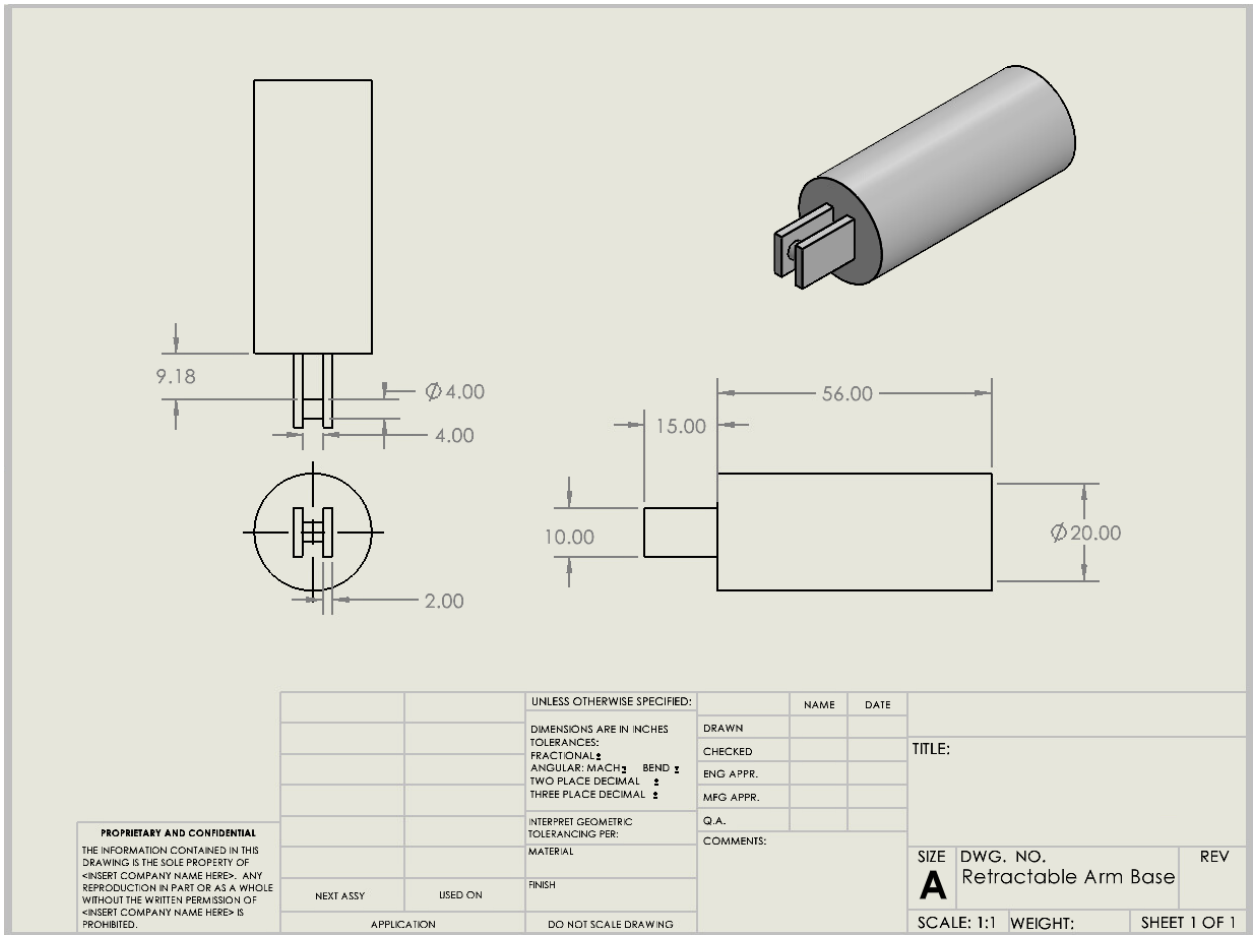

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			MFG APPR.		
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		MATERIAL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
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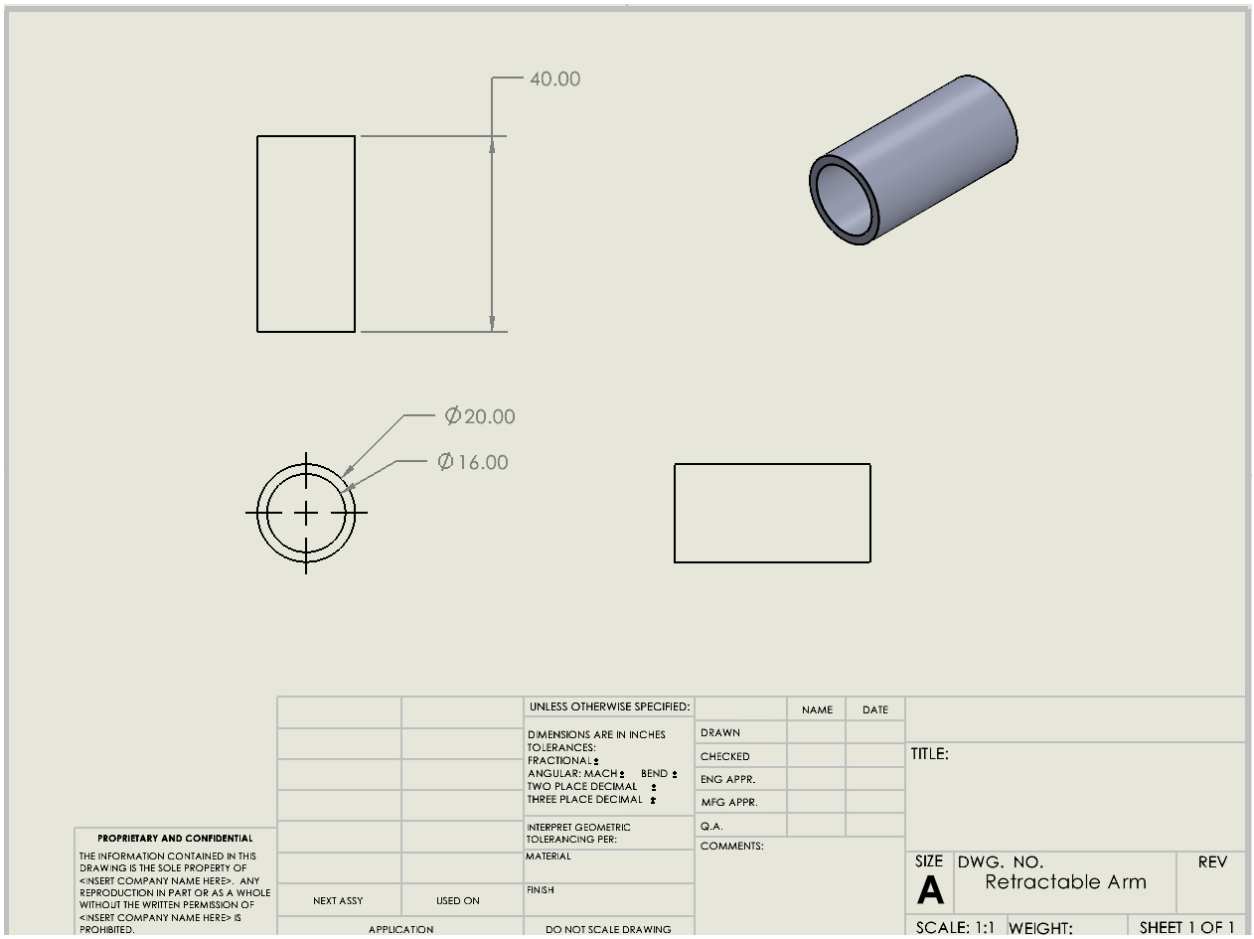
TITLE:

SIZE	DWG. NO.	REV
A	Retractable Arm Base	
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1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MATERIAL
FINISH
NEXT ASSY
USED ON
APPLICATION
DO NOT SCALE DRAWING
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
TITLE:
SIZE
A
DWG. NO.
Retractable Arm
REV
SCALE: 1:1
WEIGHT:
SHEET 1 OF 1
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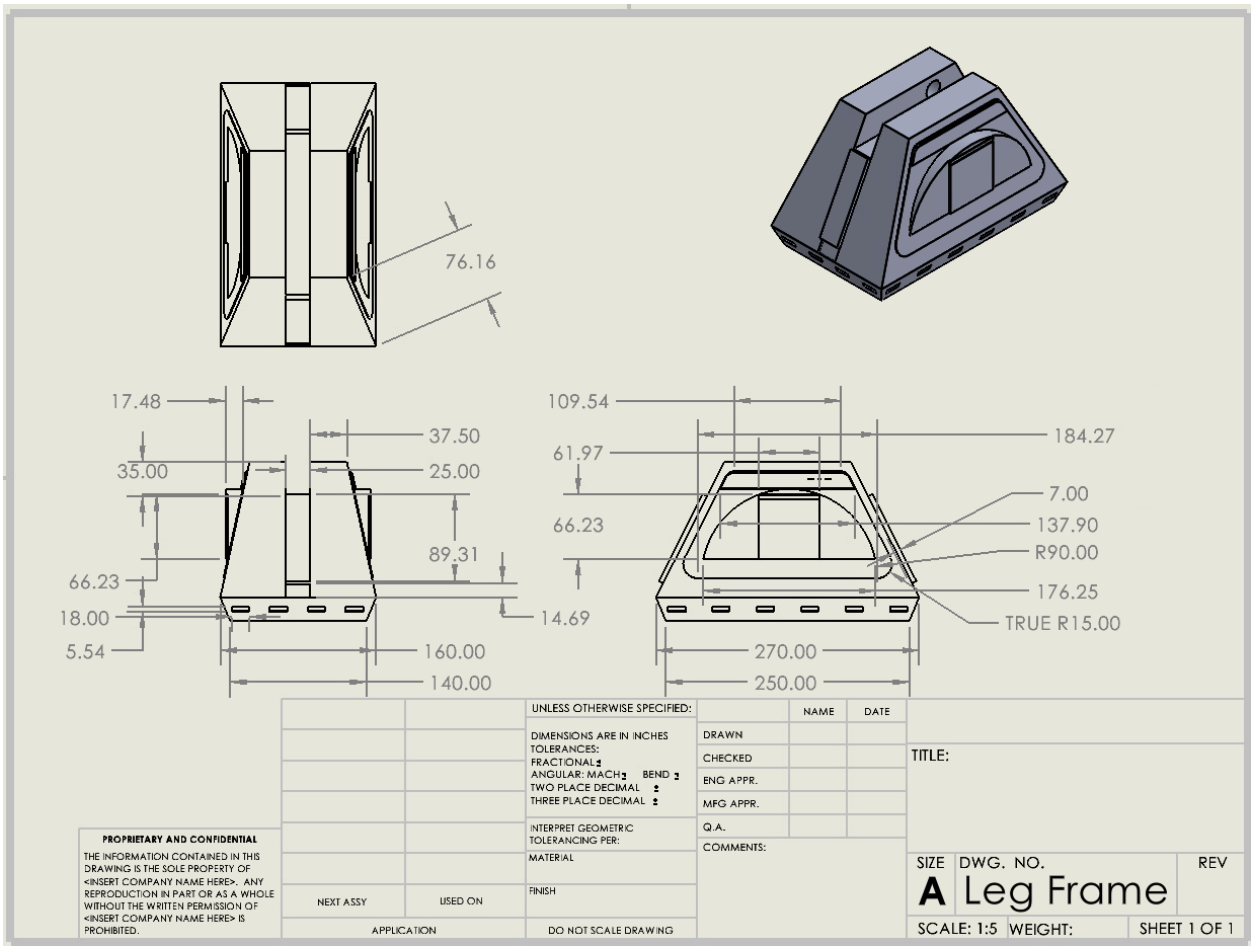
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ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
NEXT ASSY
USED ON
APPLICATION
DO NOT SCALE DRAWING
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
TITLE:
SIZE
DWG. NO.
REV
A
Leg Frame
SCALE: 1:5
WEIGHT:
SHEET 1 OF 1
PROPRIETARY AND CONFIDENTIAL
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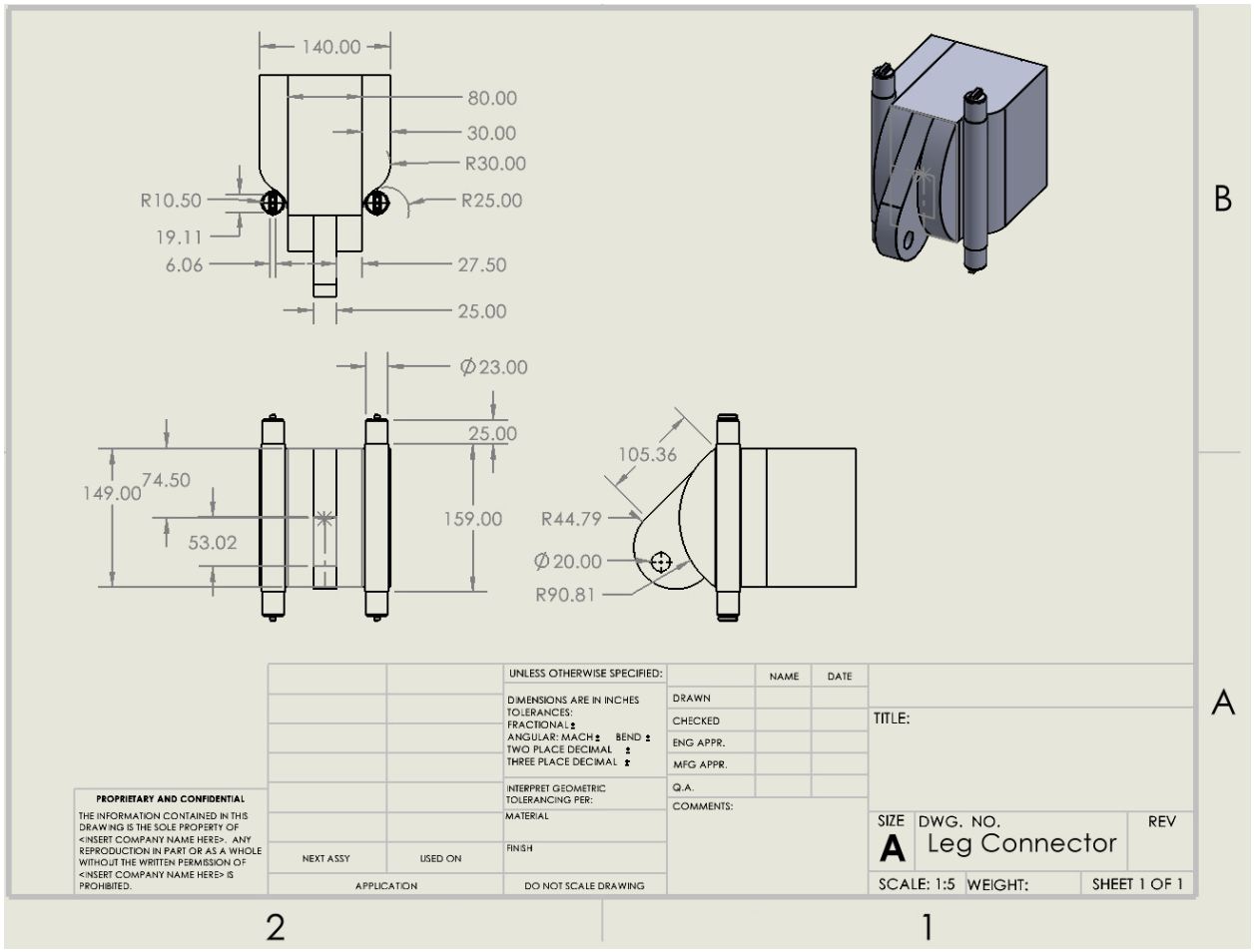
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A
2
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ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
DO NOT SCALE DRAWING
NEXT ASSY
USED ON
APPLICATION
NAME
DATE
DRAWN
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ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
TITLE:
SIZE
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DWG. NO.
Leg Connector
REV
SCALE: 1:5
WEIGHT:
SHEET 1 OF 1
PROPRIETARY AND CONFIDENTIAL
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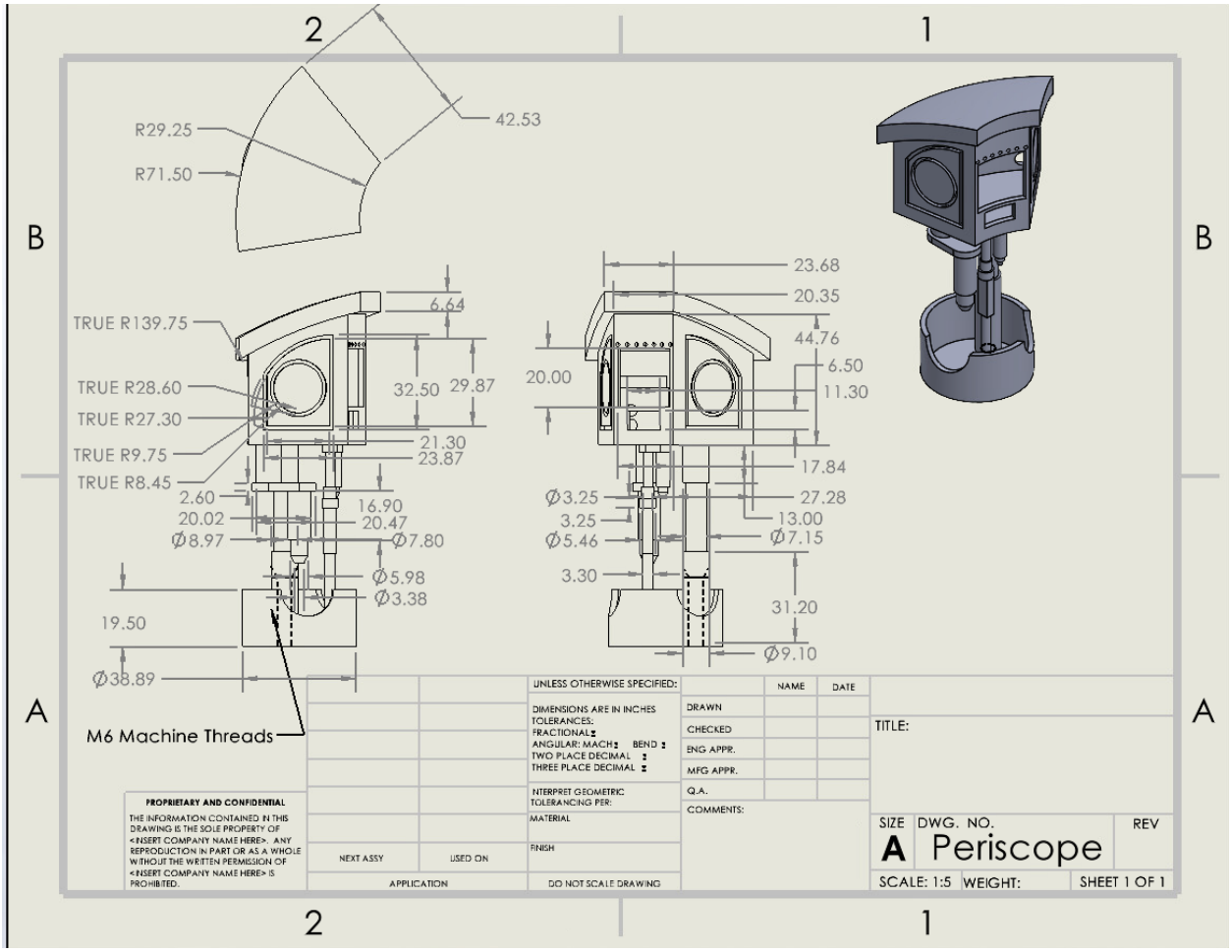
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DO NOT SCALE DRAWING
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COMMENTS:
TITLE:
SIZE
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REV
A
Periscope
SCALE: 1:5
WEIGHT:
SHEET 1 OF 1
NEXT ASSY
USED ON
APPLICATION
PROPRIETARY AND CONFIDENTIAL
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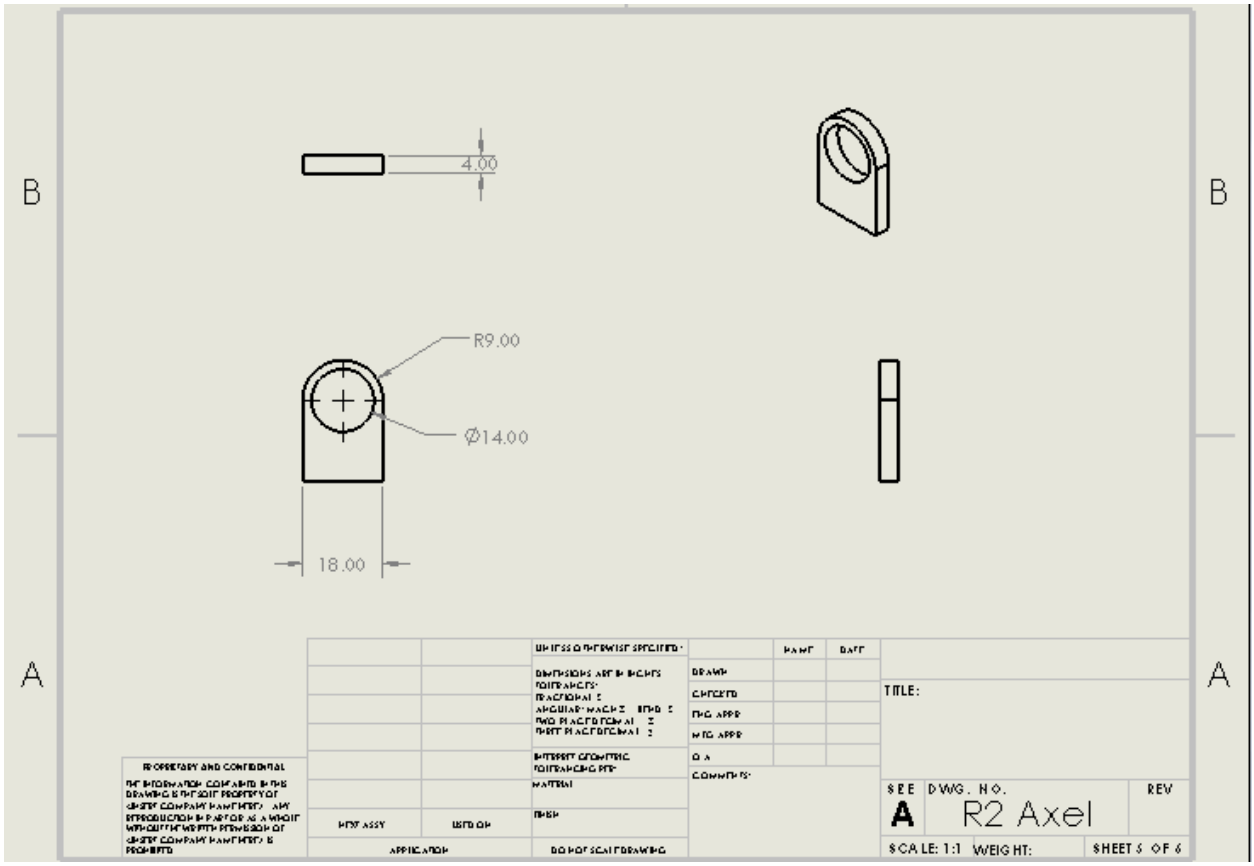
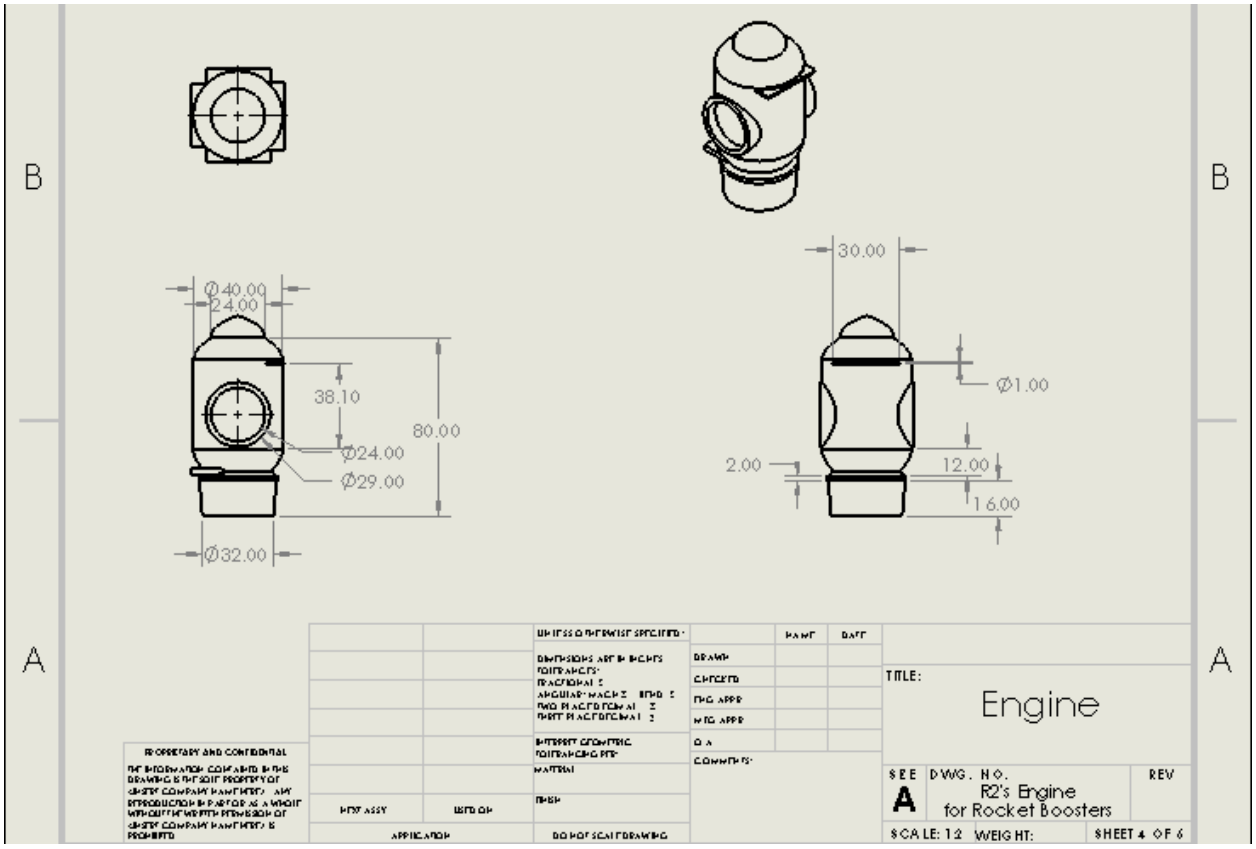

4.00
R9.00
Ø14.00
18.00
B
A
TITLE:
SIZE
A
DWG. NO.
R2 Axel
REV
SCALE: 1:1
WEIGHT:
SHEET 5 OF 6


B
A
Ø40.00
24.00
38.10
80.00
Ø24.00
Ø29.00
Ø32.00
30.00
Ø1.00
2.00
12.00
16.00
UNLESS OTHERWISE SPECIFIED:
DRAWN
CHECKED
ENG APPR
MFG APPR
Q A
COMMENTS:
NAME
DATE
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC
TOLERANCING PER:
MATERIAL
FINISH
NEXT ASSY
USED ON
APPLICATION
DO NOT SCALE DRAWING
PROPRIETARY AND CONFIDENTIAL
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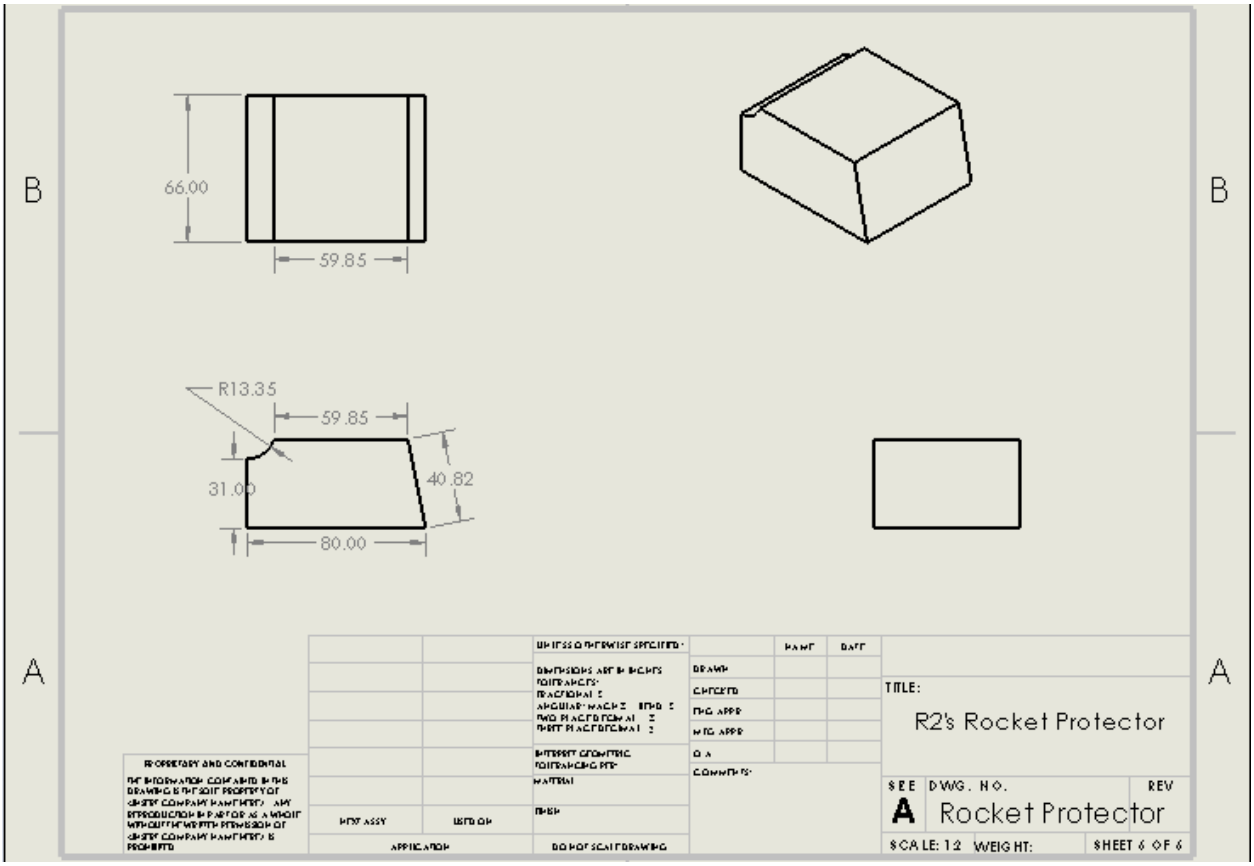
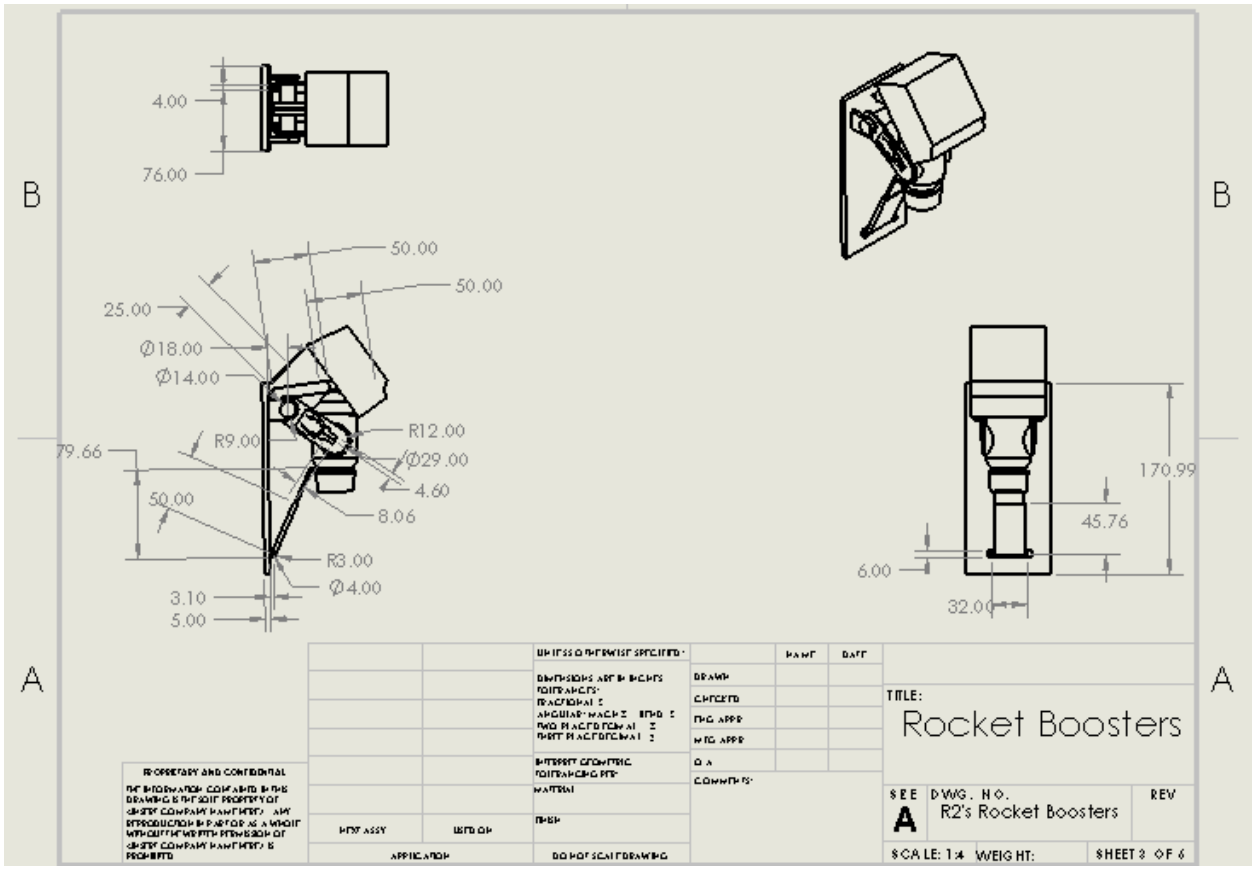
TITLE:
Engine
SIZE
A
DWG. NO.
R2's Engine
for Rocket Boosters
REV
SCALE: 1:2
WEIGHT:
SHEET 4 OF 6


66.00
59.85
R13.35
59.85
31.00
40.82
80.00
TITLE:
R2's Rocket Protector
SIZE
A
DWG. NO.
Rocket Protector
REV
SCALE: 1:2
WEIGHT:
SHEET 6 OF 6


4.00
76.00
50.00
50.00
25.00
Ø18.00
Ø14.00
R9.00
79.66
50.00
R12.00
Ø29.00
4.60
8.06
R3.00
Ø4.00
3.10
5.00
170.99
45.76
6.00
32.00
B
B
A
A
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
NEXT ASSY
USED ON
APPLICATION
DO NOT SCALE DRAWING
NAME
DATE
DRAWN
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
PROPRIETARY AND CONFIDENTIAL
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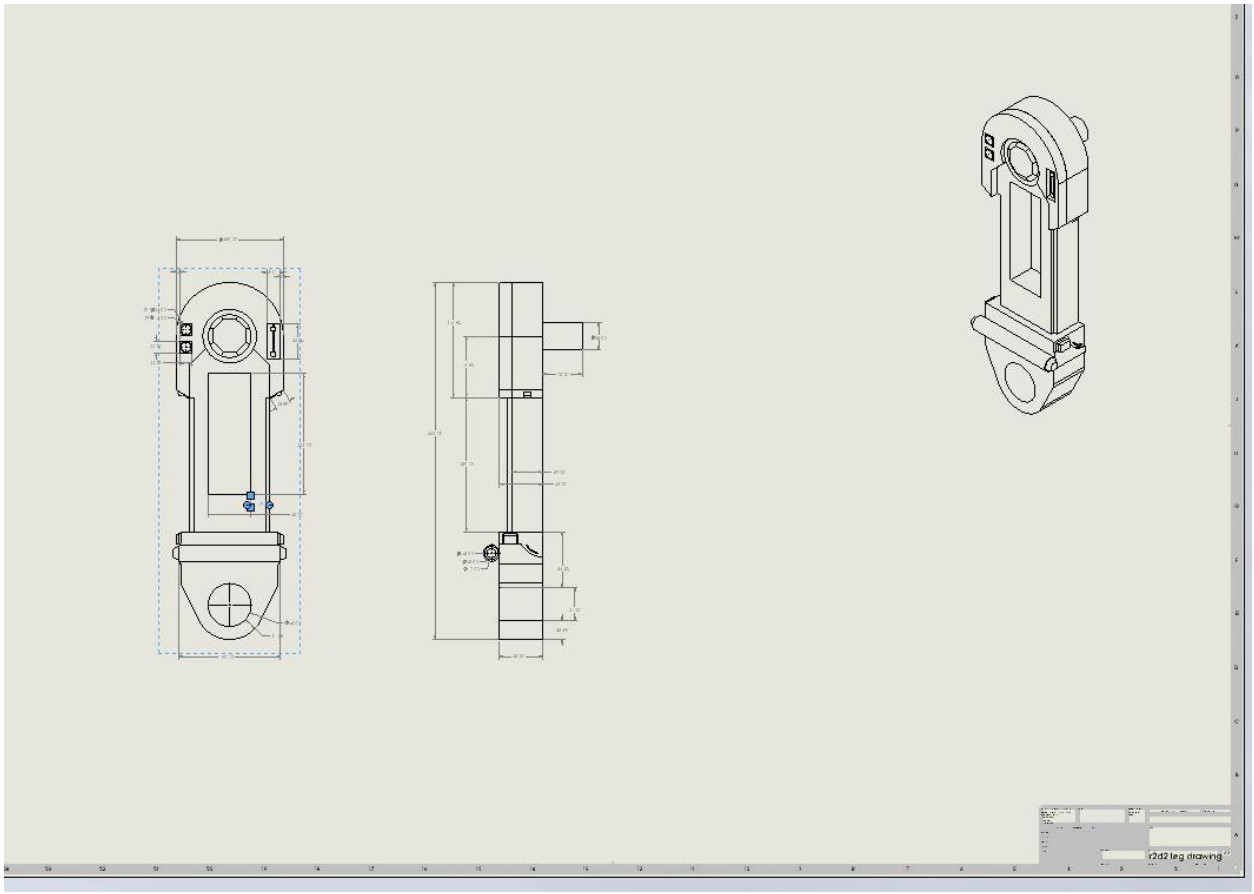
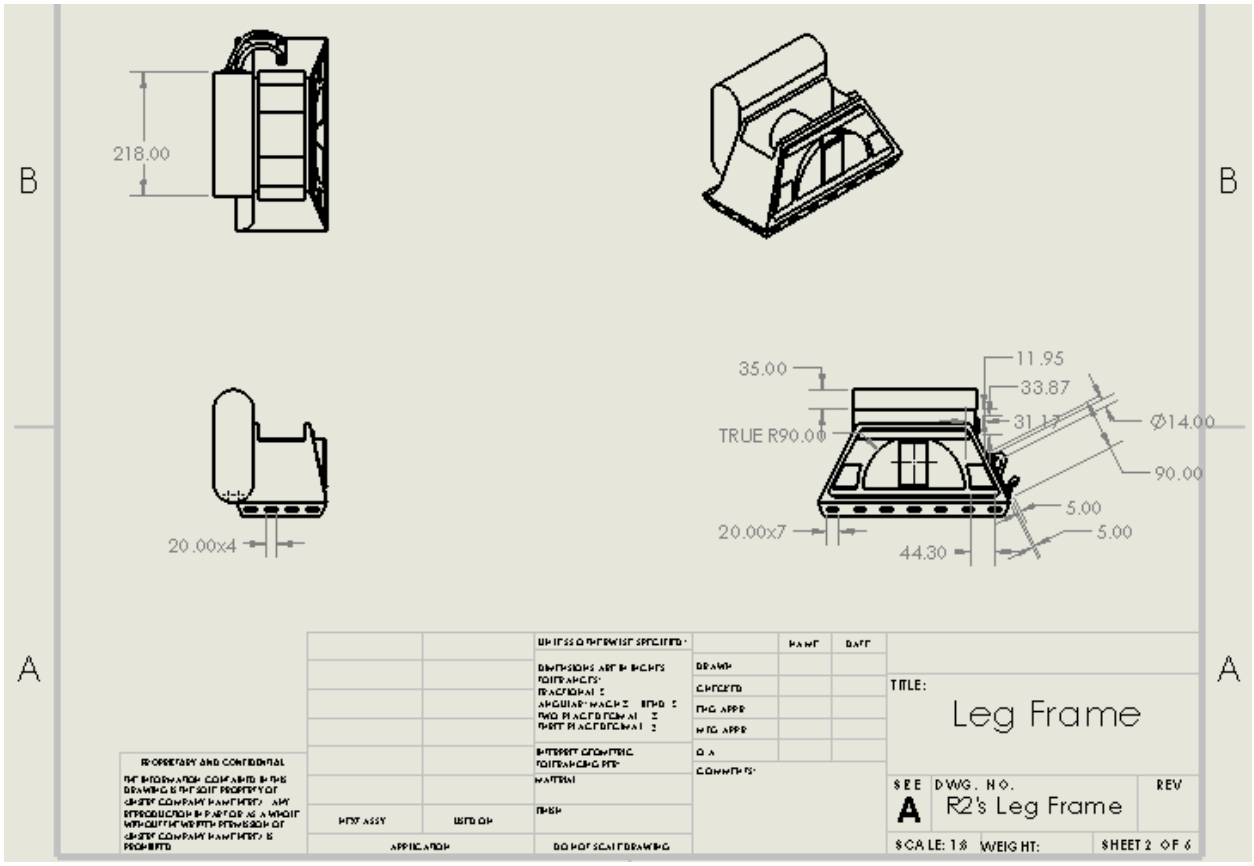
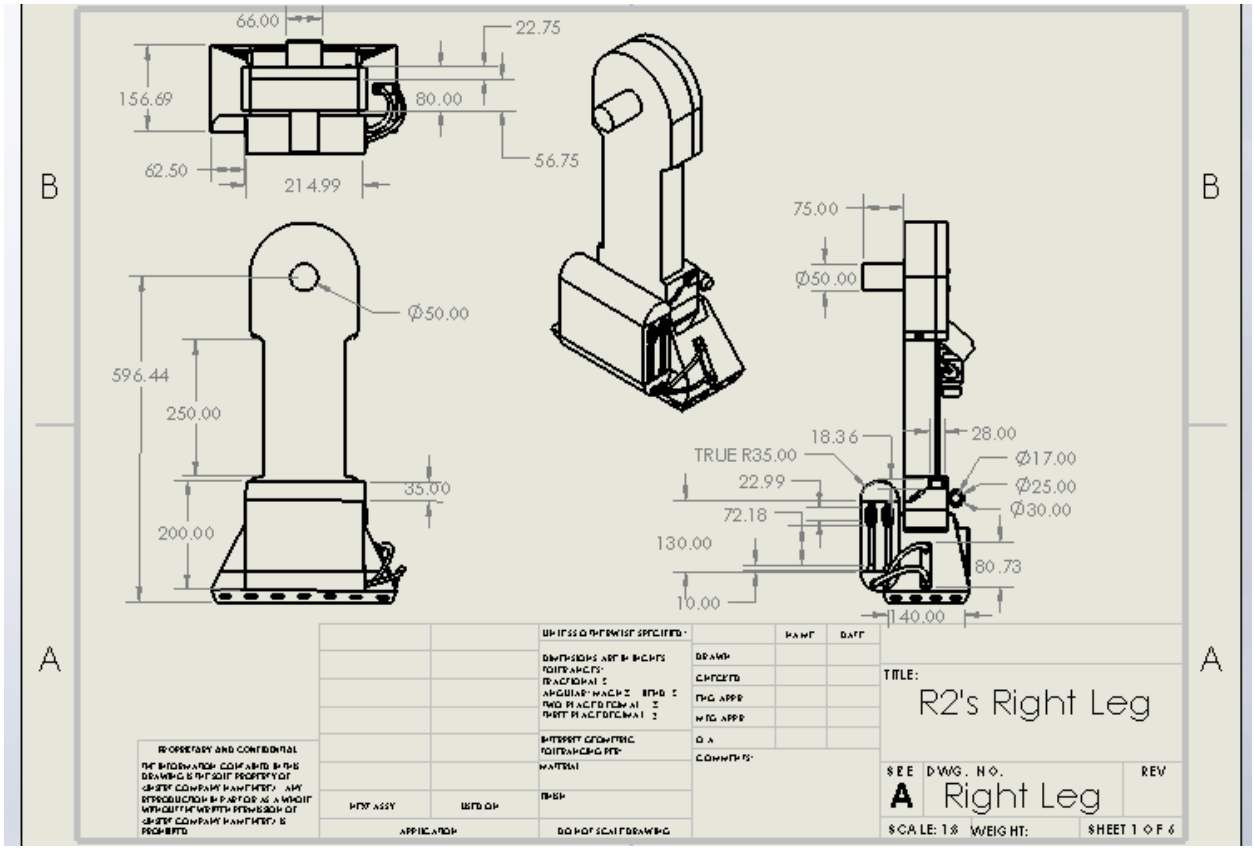
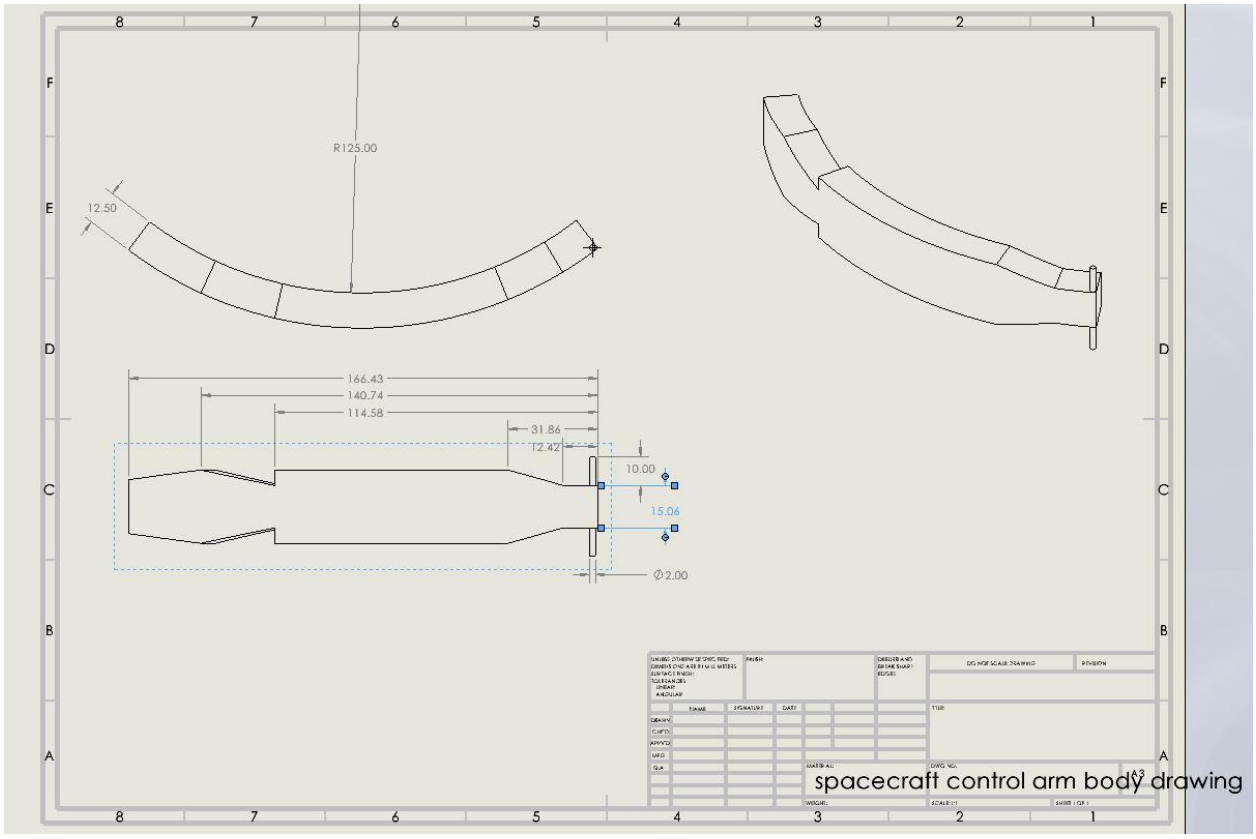
TITLE:
Rocket Boosters
SIZE
A
DWG. NO.
R2's Rocket Boosters
REV
SCALE: 1:4
WEIGHT:
SHEET 3 OF 6

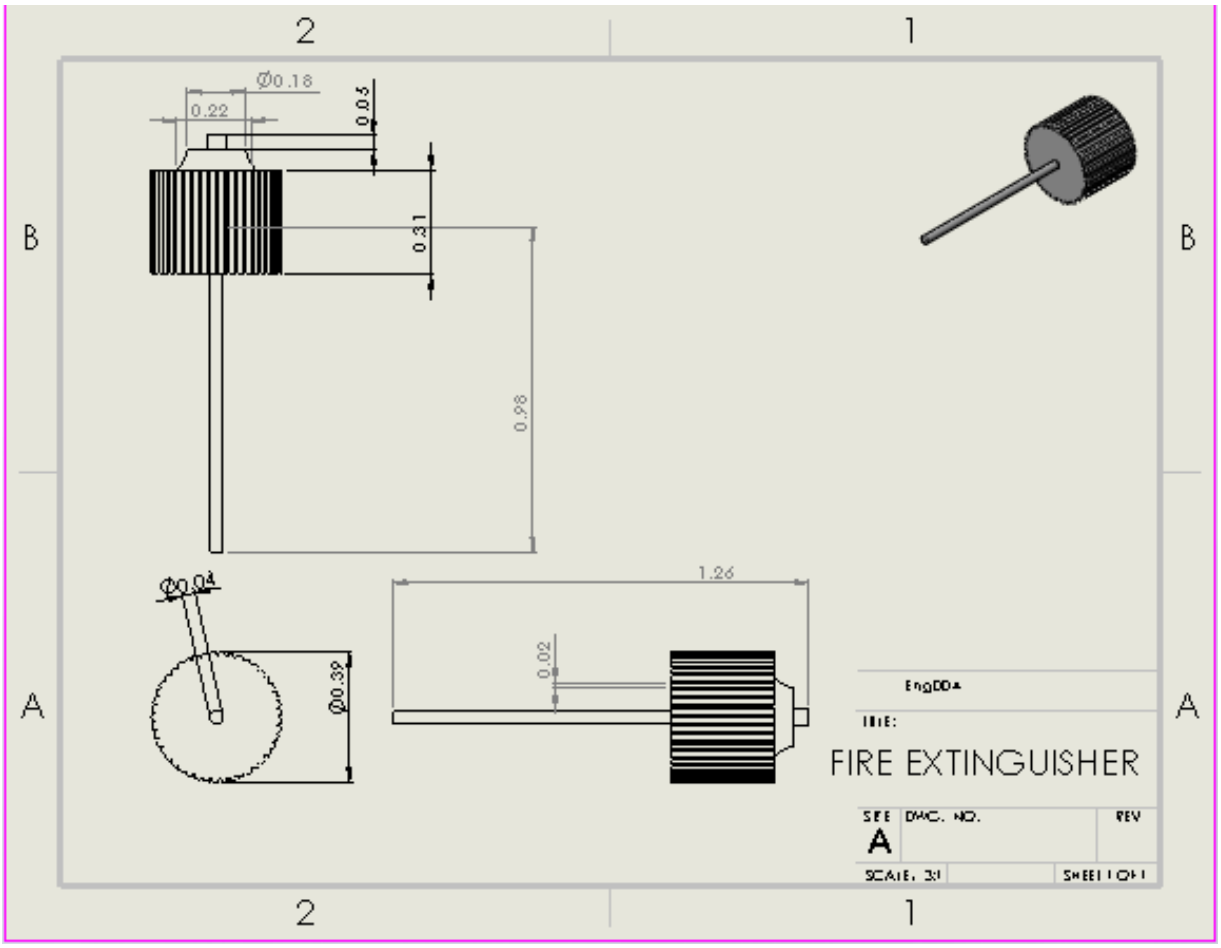

r2d2 leg drawing

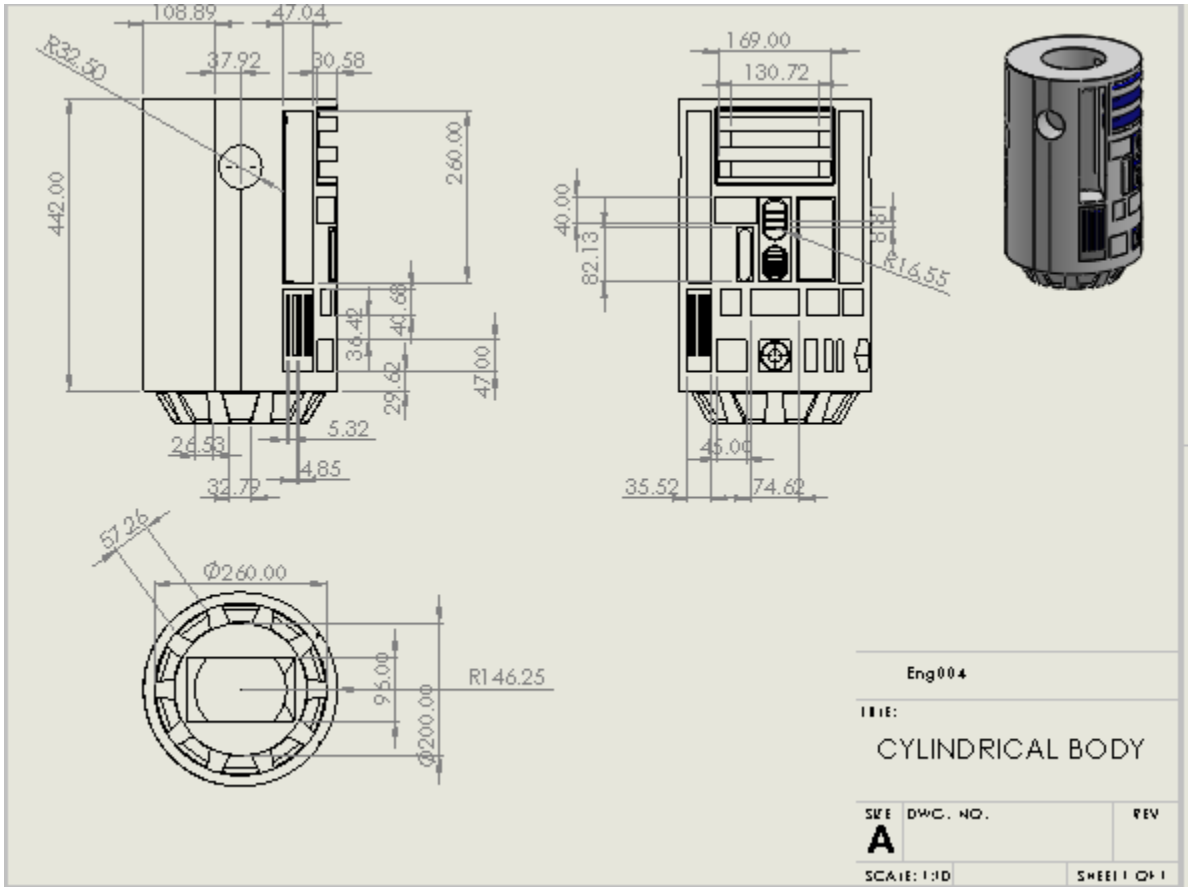

218.00
20.00x4
35.00
TRUE R90.00
11.95
33.87
31.13
Ø14.00
90.00
5.00
5.00
20.00x7
44.30
B
A
UNLESS OTHERWISE SPECIFIED:
DRAWN
CHECKED
ENG APPR
MFG APPR
Q.A
COMMENTS:
NAME
DATE
TITLE:
Leg Frame
SIZE
A
DWG. NO.
R2's Leg Frame
REV
SCALE: 1/8
WEIGHT:
SHEET 2 OF 6
PROPRIETARY AND CONFIDENTIAL
NEXT ASSY
USED ON
APPLICATION
DO NOT SCALE DRAWING

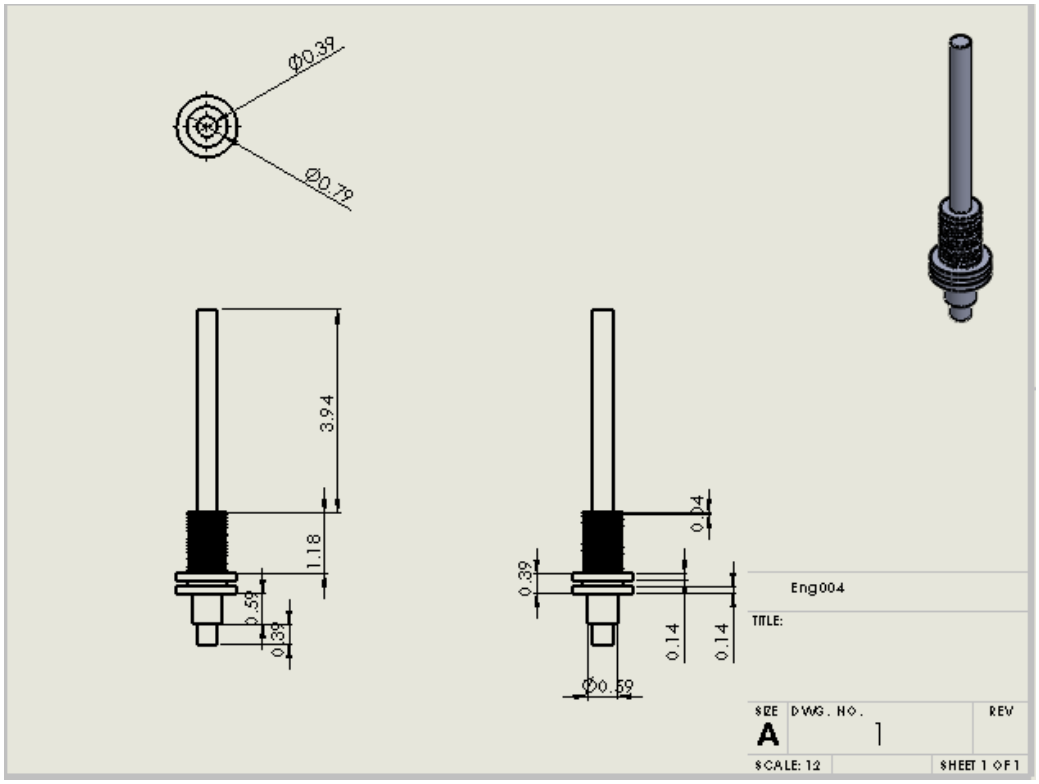

66.00
22.75
156.69
80.00
56.75
62.50
214.99
Ø50.00
596.44
250.00
35.00
200.00
75.00
Ø50.00
18.36
28.00
TRUE R35.00
Ø17.00
22.99
Ø25.00
72.18
Ø30.00
130.00
80.73
10.00
140.00
B
A
UNLESS OTHERWISE SPECIFIED:
NAME
DATE
DRAWN
CHECKED
ENG APPR
MFG APPR
Q.A
COMMENTS:
TITLE:
R2's Right Leg
SIZE
DWG. NO.
REV
A
Right Leg
SCALE: 1/8
WEIGHT:
SHEET 1 OF 6
NEXT ASSY
USED ON
APPLICATION
DO NOT SCALE DRAWING

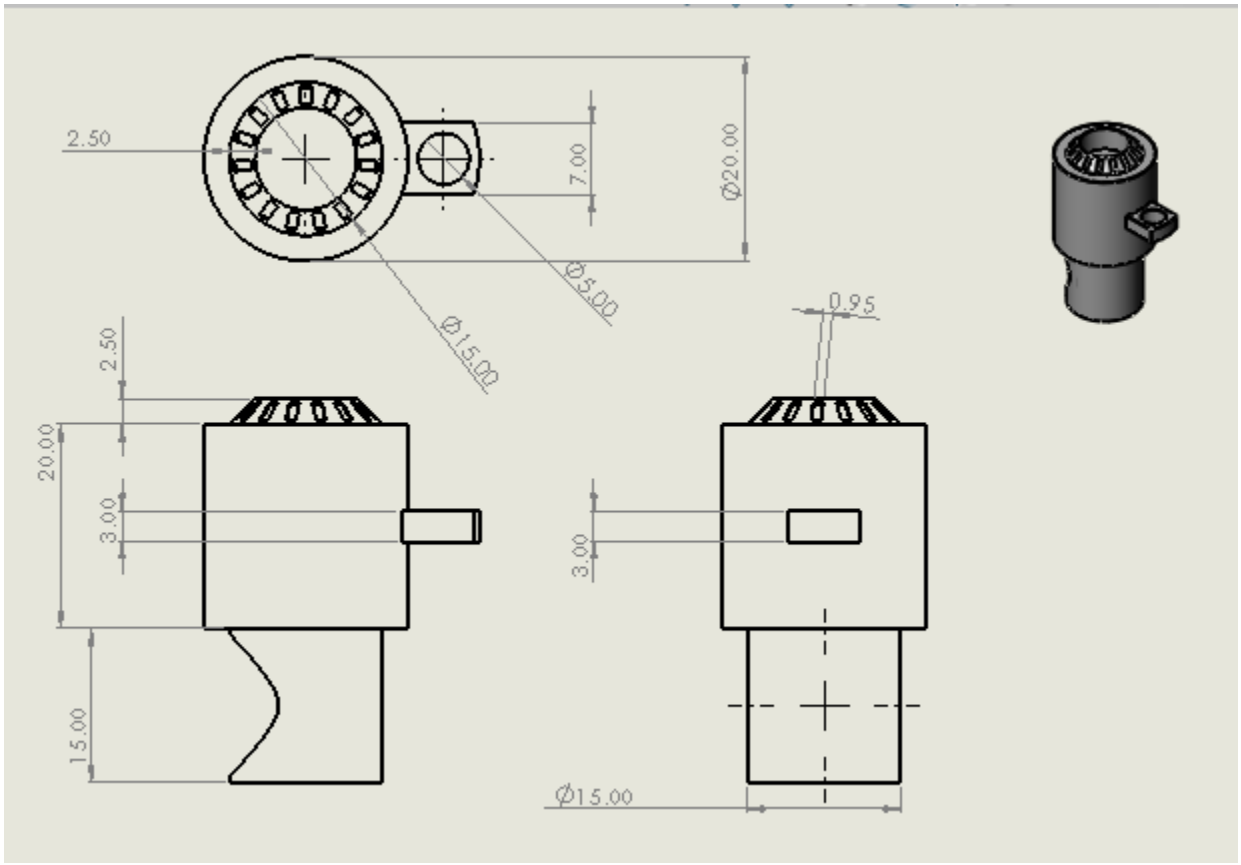


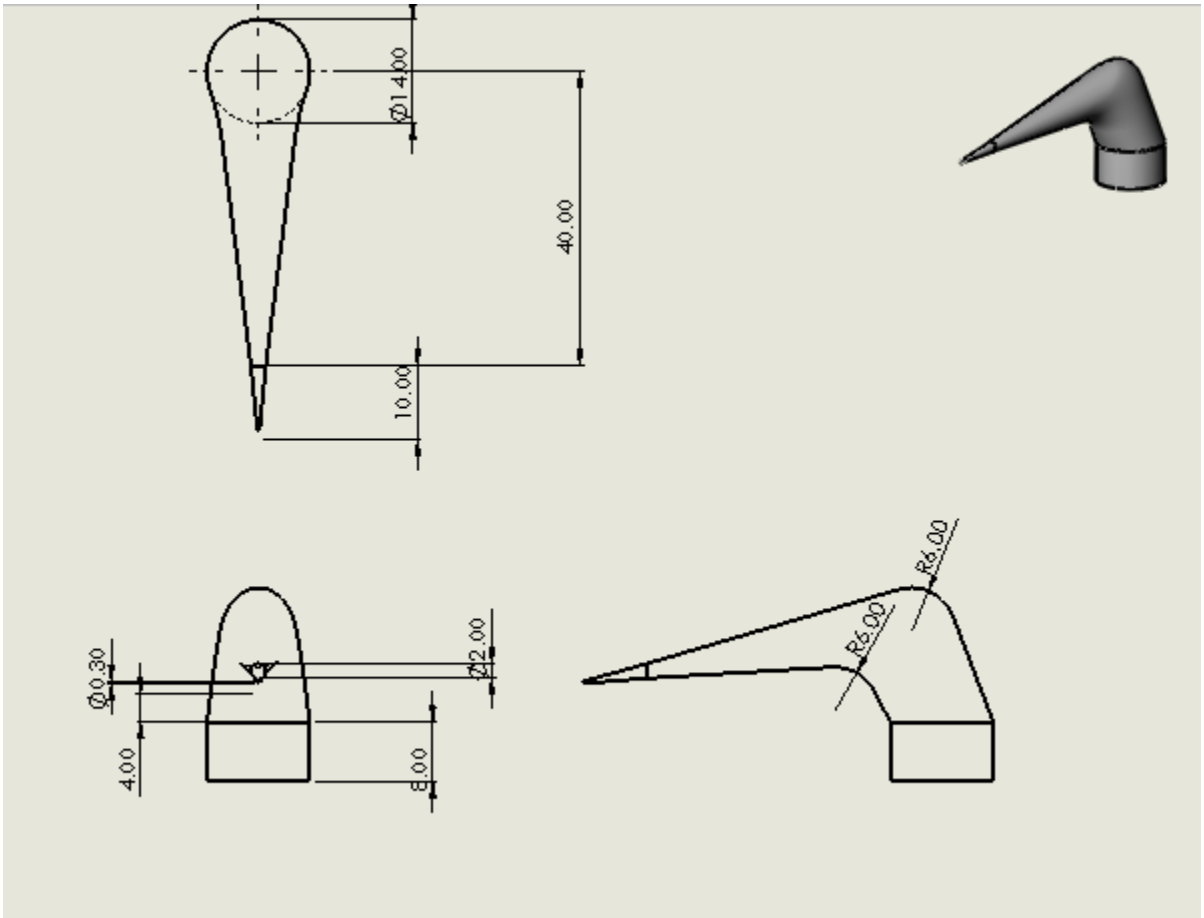
spacecraft control arm body drawing

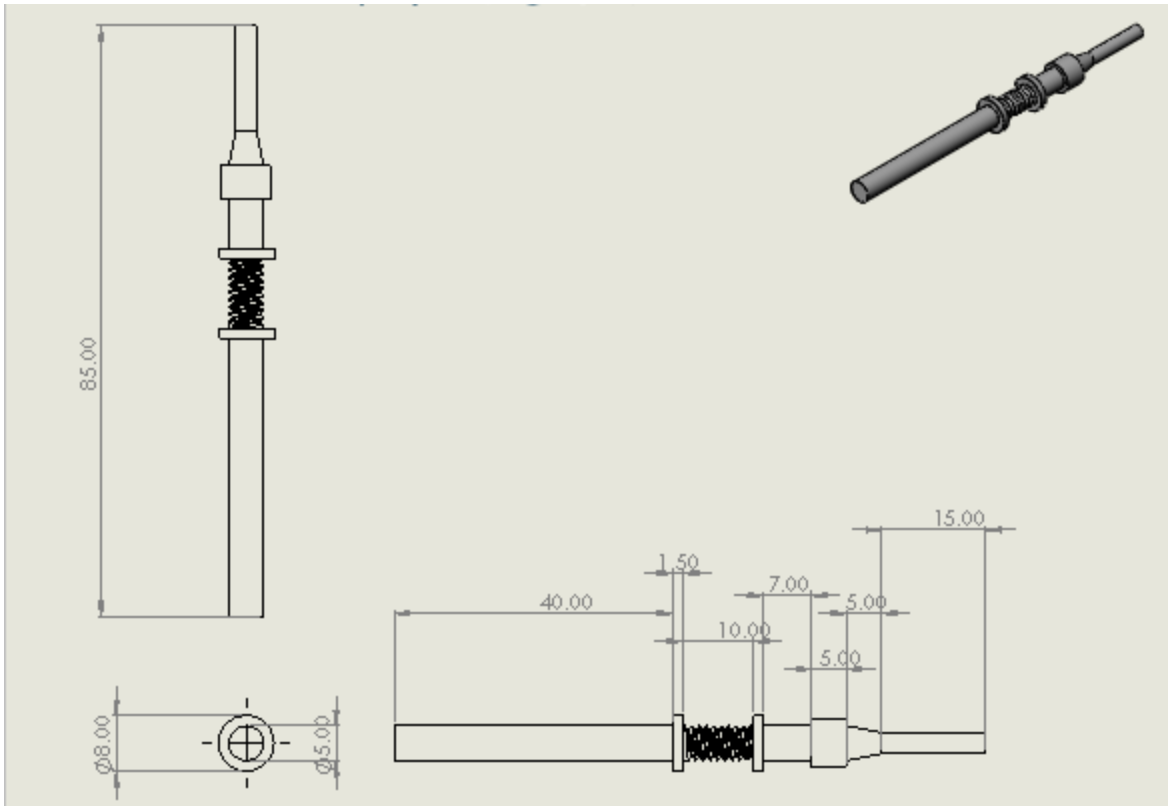

2
1
B
A
Ø0.18
0.22
0.05
0.31
0.98
Ø0.04
Ø0.39
1.26
0.02
EngDDA
TITLE:
FIRE EXTINGUISHER
SIZE
A
DWG. NO.
REV
SCALE: 3:1
SHEET 1 OF 1


108.89
47.04
R32.50
37.92
30.58
442.00
260.00
36.42
40.68
47.00
29.62
5.32
24.53
4.85
32.79
169.00
130.72
40.00
82.13
6.81
R16.55
45.00
35.52
74.62
57.26
Φ260.00
96.00
R146.25
Φ200.00
Eng004
TITLE:
CYLINDRICAL BODY
SIZE
A
DWG. NO.
REV
SCALE: 1:10
SHEET 1 OF 1


Ø0.39
Ø0.79
3.94
1.18
0.59
0.39
0.04
0.39
0.14
0.14
Ø0.59
Eng004
TITLE:
SIZE
A
DWG. NO.
1
REV
SCALE: 1:2
SHEET 1 OF 1


2.50
7.00
Ø20.00
Ø5.00
Ø15.00
0.95
2.50
20.00
3.00
15.00
3.00
Ø15.00


Ø14.00
40.00
10.00
Ø0.30
Ø2.00
4.00
8.00
R6.00
R6.00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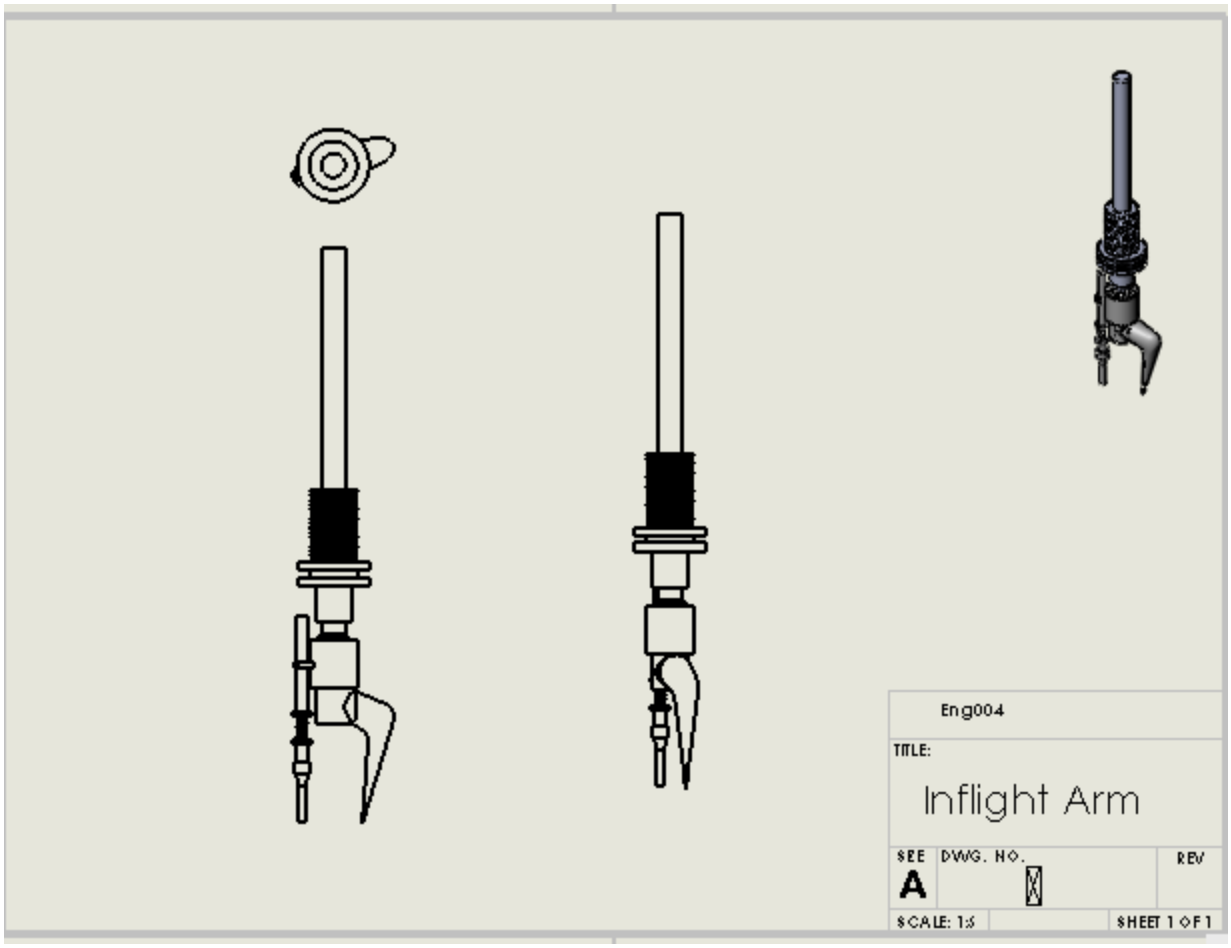
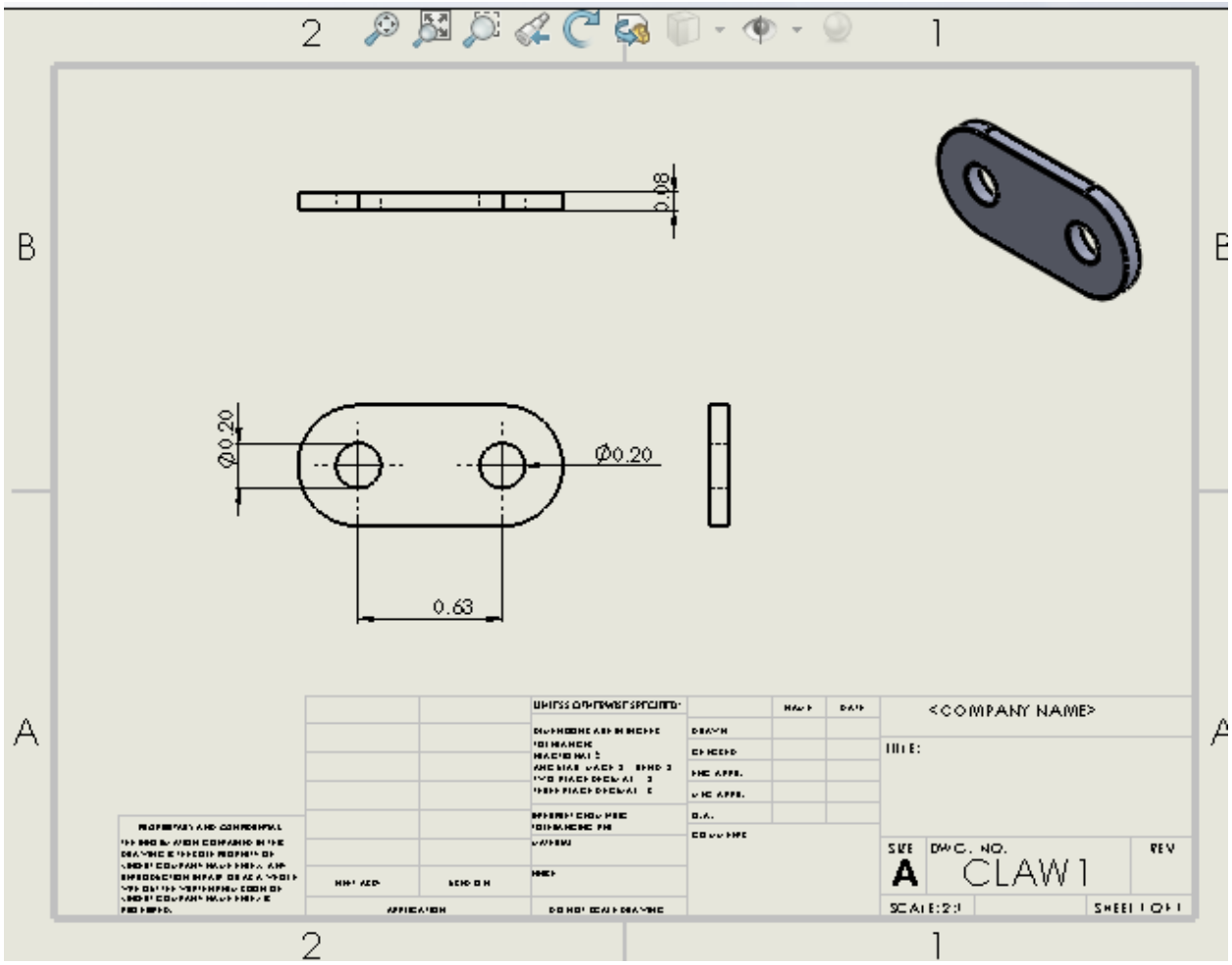
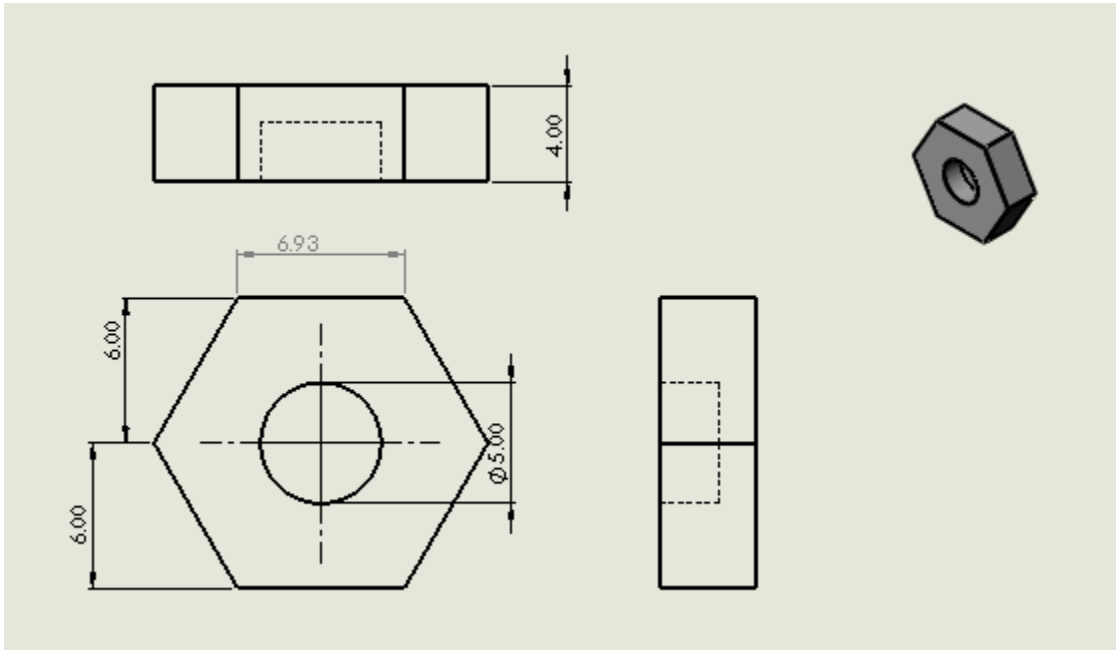
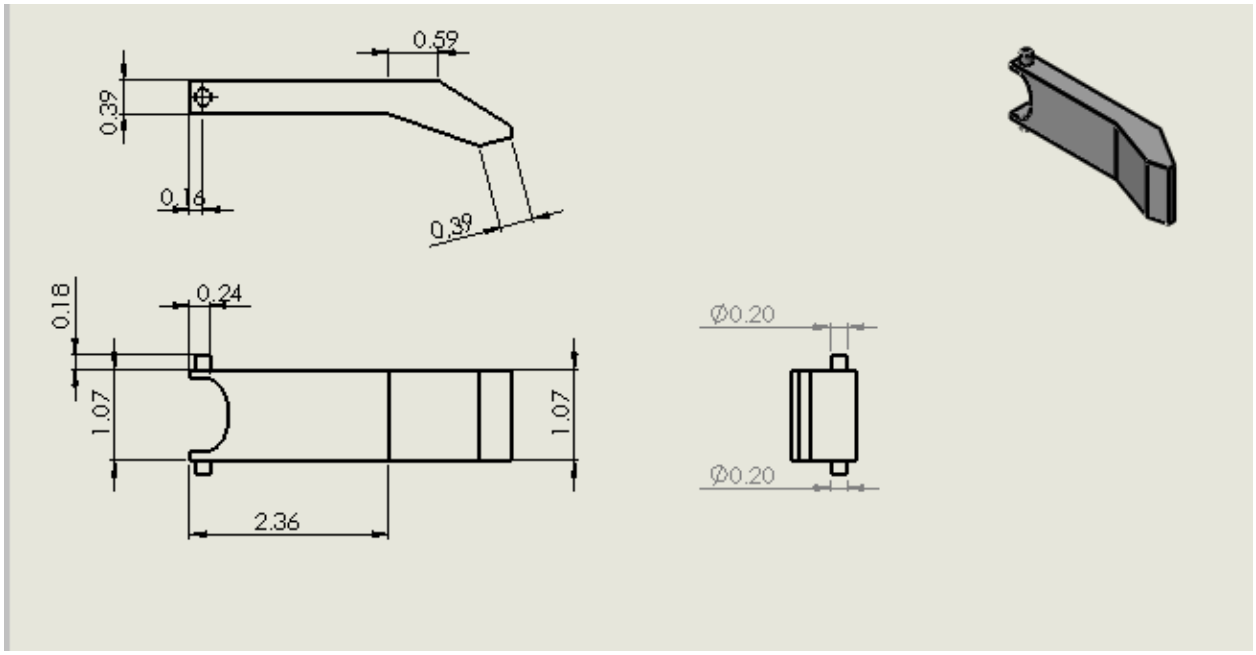
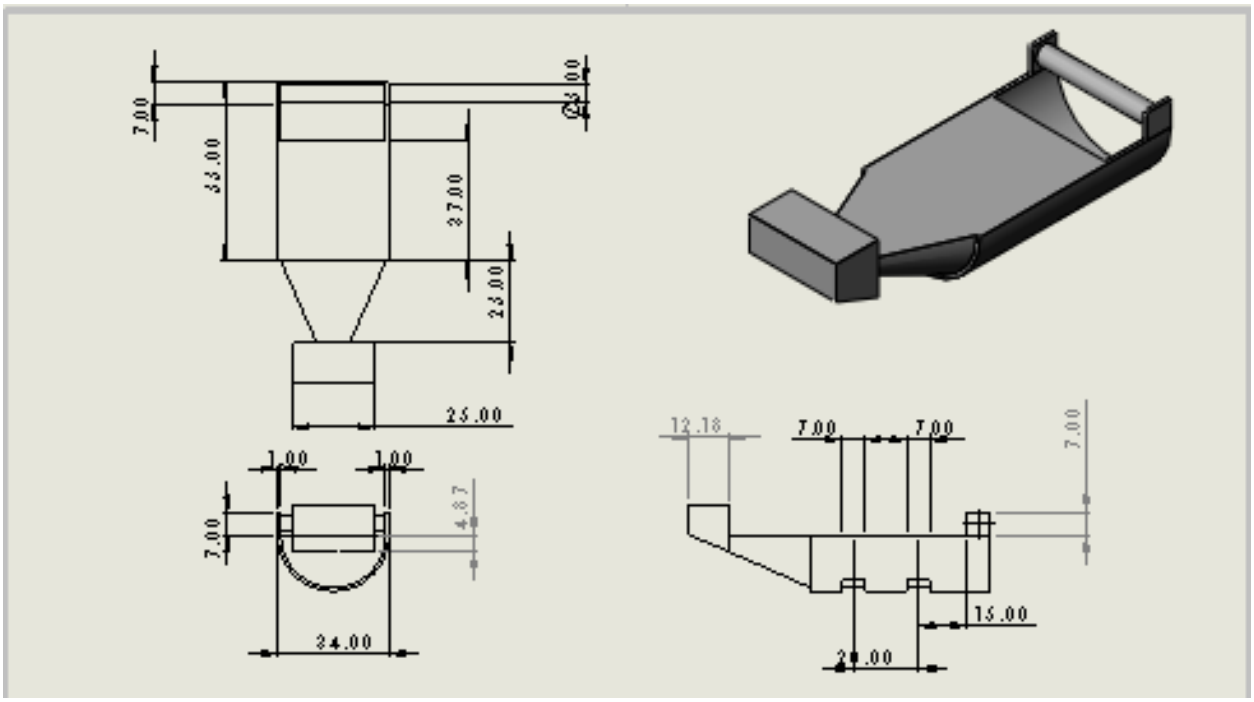
Ø8.00
Ø5.00
40.00
1.50
7.00
5.00
10.00
5.00
15.00

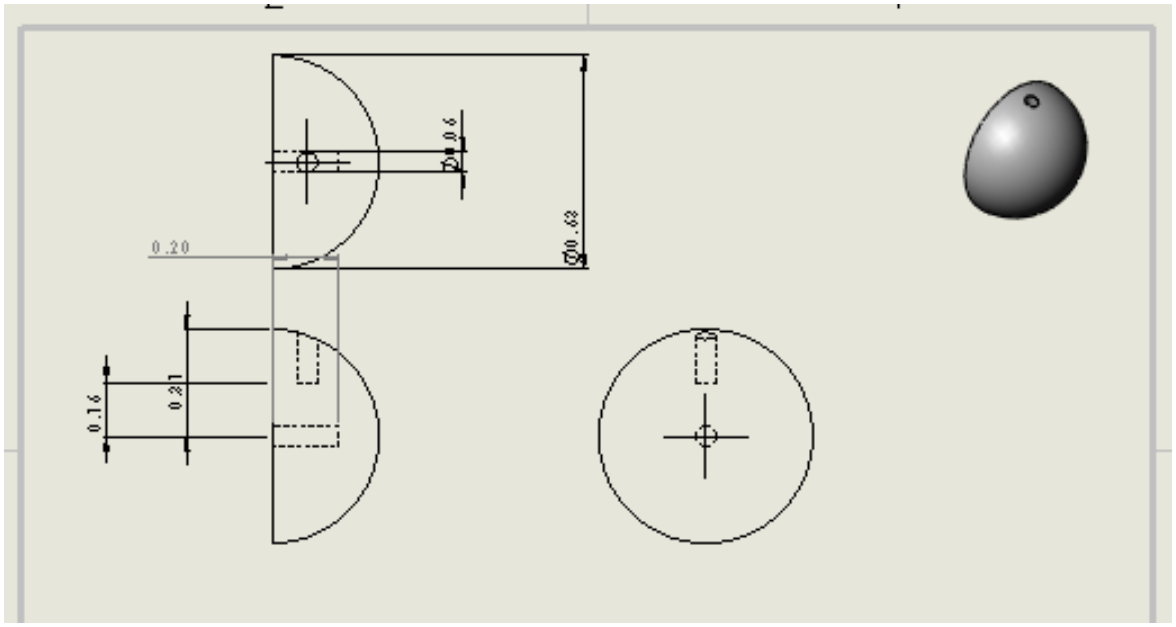

Eng004
TITLE:
Inflight Arm
SIZE
A
DWG. NO.
REV
SCALE: 1:5
SHEET 1 OF 1

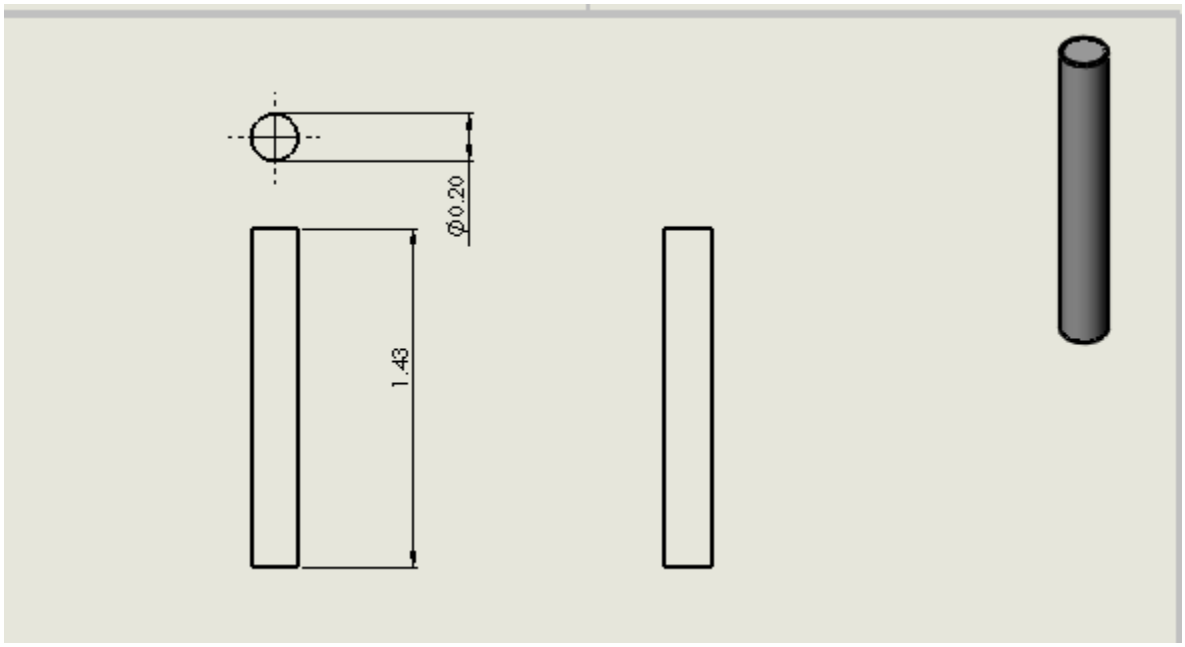

0.08
Ø0.20
Ø0.20
0.63
<COMPANY NAME>
SIZE
A
DWG. NO.
CLAW1
REV
SCALE:2:1
SHEET 1 OF 1

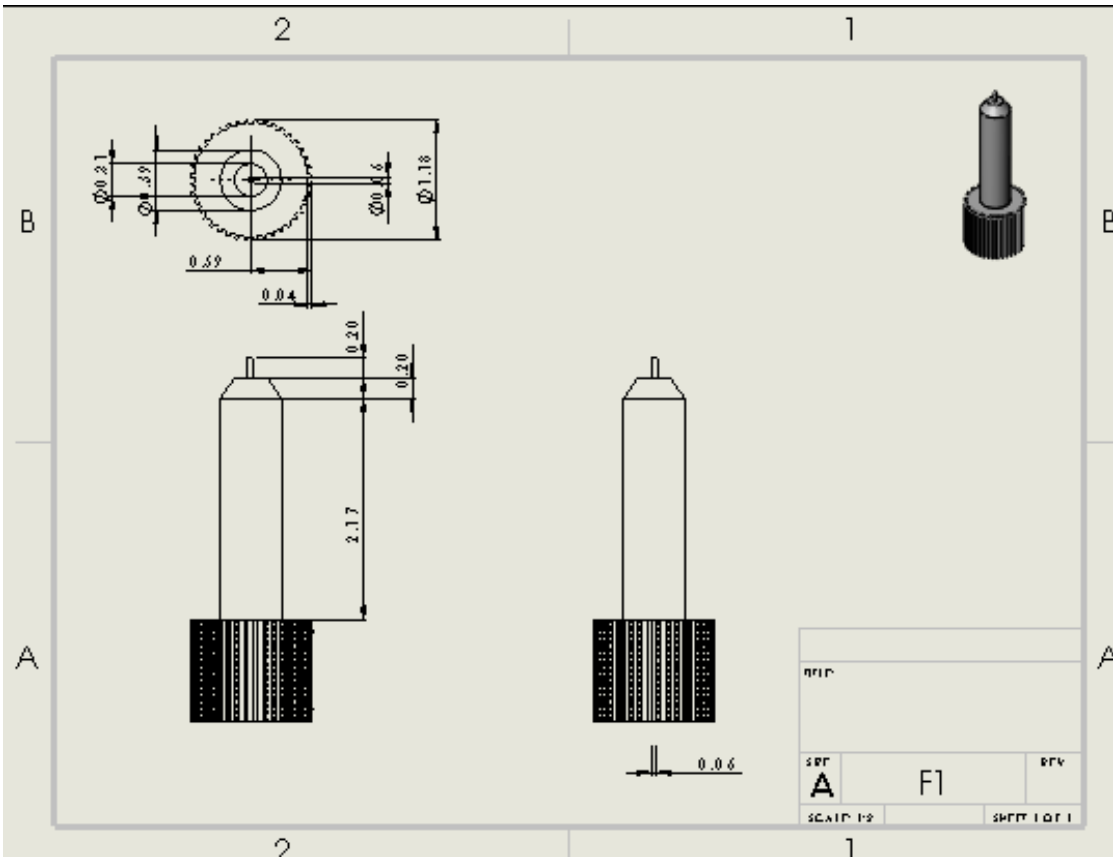

4.00
6.93
6.00
6.00
Ø5.00

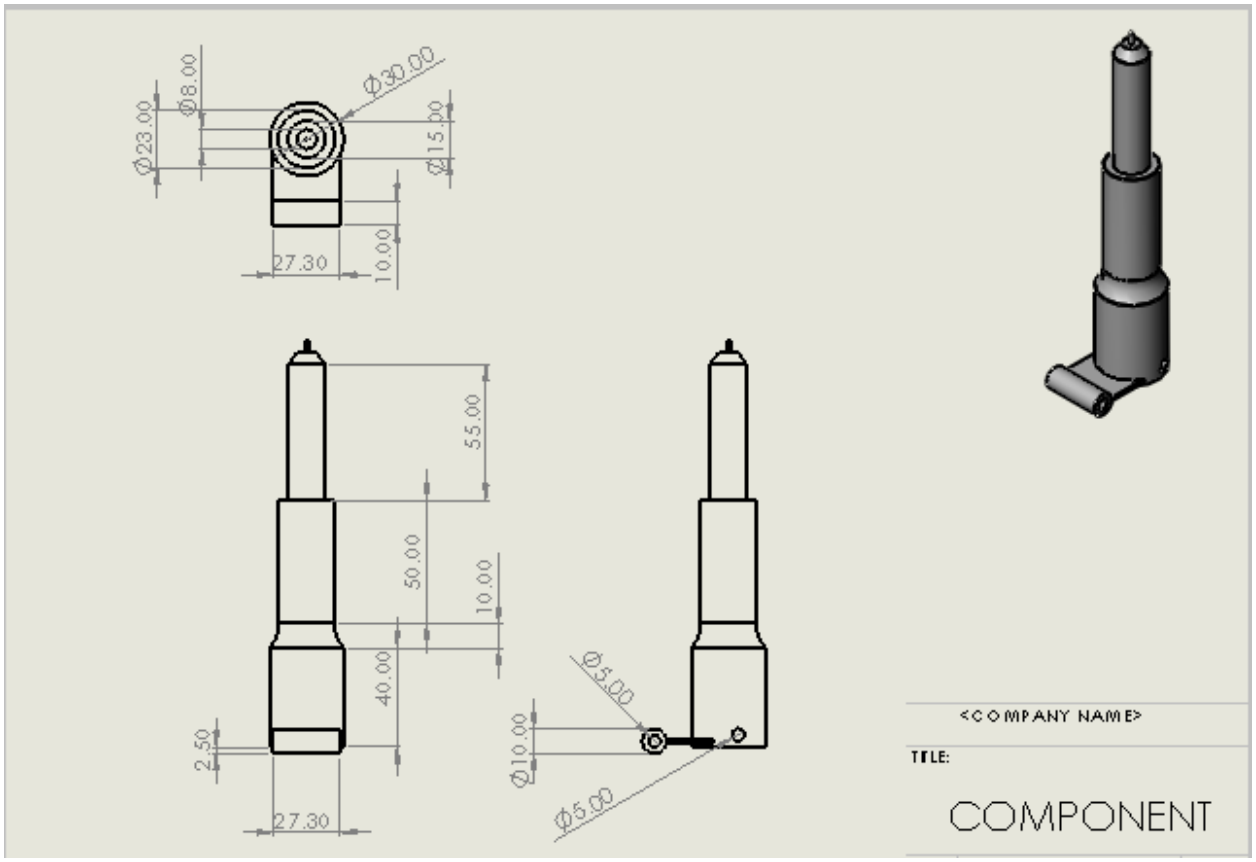

0.59
0.39
0.16
0.39
0.18
0.24
1.07
1.07
2.36
Ø0.20
Ø0.20


7.00
33.00
27.00
23.00
25.00
1.00
1.00
7.00
4.87
24.00
12.18
7.00
7.00
7.00
15.00


0.20
0.16
0.21


Ø0.20
1.43


2
1
B
A
Ø0.21
Ø0.39
Ø0.16
Ø1.18
0.59
0.04
0.20
0.20
2.17
0.06
SIZE
A
F1
REV


Ø8.00
Ø30.00
Ø23.00
Ø15.00
27.30
10.00
55.00
50.00
10.00
40.00
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Ø5.00
Ø10.00
Ø5.00
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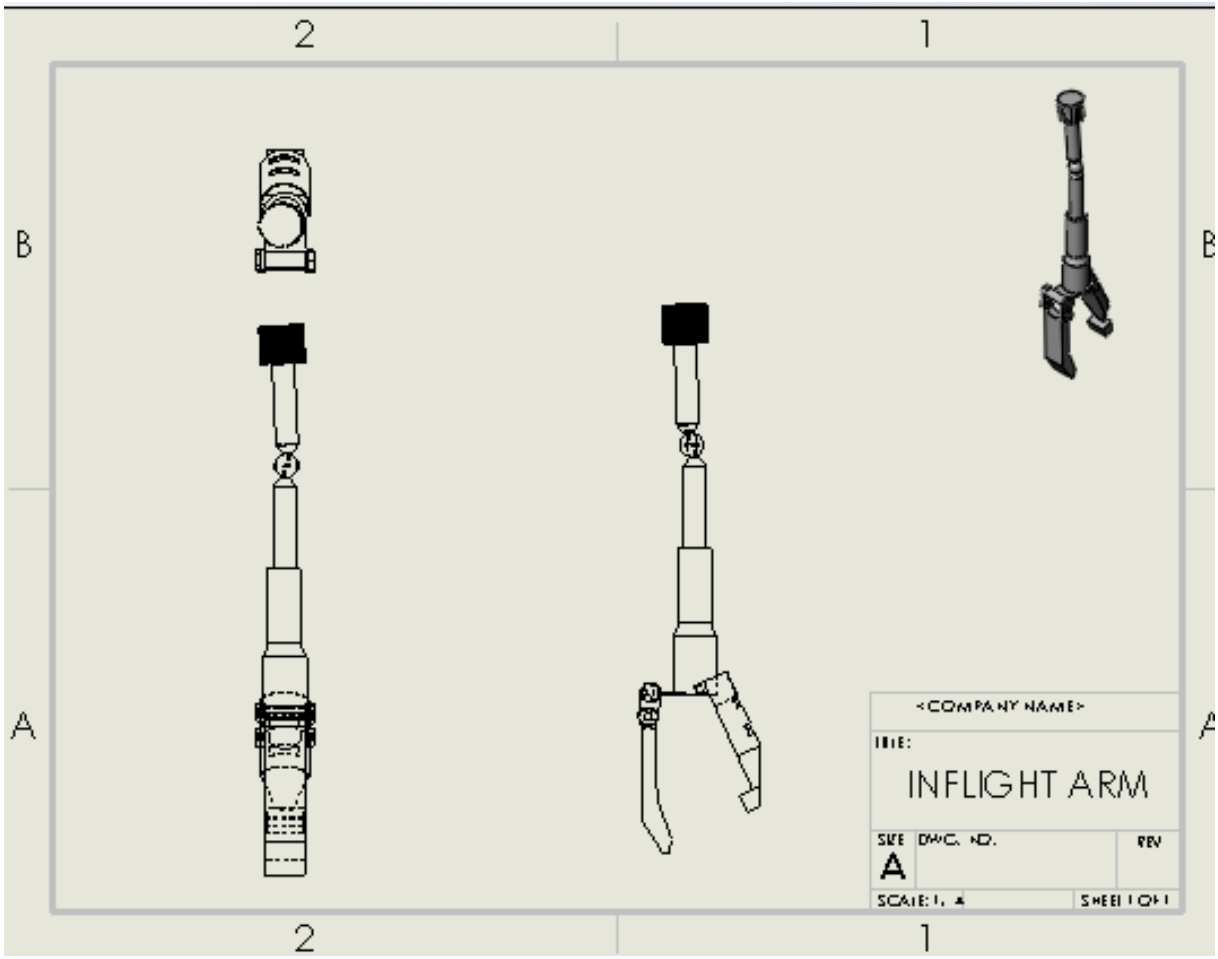
TITLE:
COMPONENT



All units are in millimeters