Tremor-Resistant Cane

Our product is a therapeutic cane that resists tremors from those with muscle degenerative diseases, specifically Parkinson's, that helps increases stability, safety, and **independence of its user.** The idea for targeting people with Parkinson's and other muscle-degenerative diseases came from knowing those who have suffered from these diseases. For example, my grandfather has been to the hospital on numerous occasions for falling due to his tremors causing him to alter the position of his cane. After seeing my grandfather go through many of these scary and severe falls, it occured to our group that many other people with similar conditions may go through experiences like these. After assessing our target group and the problem we wanted to fix, I came up with the idea to create a cane that resists the forces of tremors to prevent unnecessary falls.

The basic structure of the cane is fairly standard as we did not want to make a cane with an overly cluttered aesthetic. In order to make our product more unique, we decided to make a more stable 4-pronged wide base to increases stability and reduce the chances of a fall. Another feature we added to our product to make it more desirable was a secondary handle. Under most circumstances, people with muscle-degenerative diseases are elders and would likely have problems getting from a seated to a standing position. The second handle was placed 180 degrees from the primary handle and was staggered in height. This handle also folds upwards to increase compactness. This handle allows for more independence for the user as it adds an elevated surface that can be useful in public settings where there may not be other supports. As for the tremor-resisting aspect of the cane, it was a little harder to come up with a solution. After researching possible mechanisms, the most feasible and cheapest solution was to use a ball and socket with the socket being laced with rubber to increase friction. In order to further restrict the range of motion of the main frame of the cane, we added a cylindrical housing for the ball and socket with a cap that acts as a hard stop in 360 degrees. After taking all possible issues with the product, and creating multiple concept sketches, we combined all the best aspects of each designs to form our final design of the cane.

Concept Selection Matrix/Concept Sketches

	Weight Factor	Rating 1 (concept 1)	Rating2 (concept 2)	Rating 3 (concept 3)	Wtd Rating 1	Wtd Rating 2	Wtd Rating 3
Aesthetics	3	3	2	3	9	6	9
Manufacturing Cost	5	4	3	3	20	15	15
Shelf Life	2	4	5	5	8	10	10
Weight	4	5	3	3	20	16	12
Size	3	3	5	5	9	15	15
Ease of Maintenance	4	3	4	5	12	16	20
Resistance to corrosion, erosion and water	5	2	4	5	10	20	25
Reliability	5	4	5	5	20	25	25
Resistance to temperature	4	3	5	5	12	20	20
Number of parts	3	5	4	5	15	12	15
Total					135	155	166

Product Design Specifications

1. **Performance**
    a. Foldable Legs and additional handle used for aid in standing up should be able to be deployed in under 2 seconds
    b. The deploying process should be successful 98/100 times
    c. The spring used for mobility of cane should provide resistance to motion in 360 degrees
    d. Built in Life alert system that notifies police in case of fall or attack
2. **Environment**
    a. Should be functional in all temperatures ranging from 0 to 110 degrees Fahrenheit
    b. Should be functional in altitudes ranging from sea level to 3000 ft
    c. Should be functional anywhere from 0 to 100% humidity
    d. No corrosion from water and no oxidation on spring
    e. Should be cleaned by just water rinsing
    f. Product is targeted for people with muscle degenerative disease or for elders who have trouble with tremors in their hands
3. **Service Life**
    a. 2-3 year service life where the only replacements should be on the tabs of each leg and the spring.
4. **Maintenance**
    a. This is not economic nor is it essential and is purely a commercial product
    b. Regular maintenance will be available however it should be unnecessary.
        i. Only parts being replaced are plastic tabs for friction with ground and spring
    c. Consumable spares would add minimal revenue and should be able to be maintenanced by household tools
5. **Target Costs**
    a. Canes that have similar function without the range of motion that our cane will provide cost an average of 19.00 USD so because our product is specialized and targeted towards a more specific group the price should be an estimated 25.00 USD
    b. The company could not afford a tool up because the target group is too small and the market is so big that there is small chance for success.
    c. This product is not compatible, because it is a separate product altogether. There will be enough profit to keep the company afloat, but not anything sufficient.
6. **Competition**
    a. There are a multitude of products that compete with this cane, but the product we have in mind has an added feature that we hope is extremely useful for our target group
7. **Shipping**
    a. Because the demand of this project is extremely small we will probably have to individually mail products and for pure cost purposes it would have to be in the North and Central American Regions
8. **Product Volume**

a. We plan on making this product to be either telescoping or collapsing in order to increase compactness and storage options.
b. The assembly of this project would definitely be line production
c. Bar and Tube Fabrication

9. Packing

a. The packaging would be in the corrugated box form with some sort of stuffing to prevent the product for moving within the box
b. This should take up 20% of total cost at a maximum
c. The packaging must at least limit volume to as soft as possible and should be light for convenience purposes

10. Manufacturing Facility

a. It would be too costly to create a new plant, so we are designing to fill and existing plant.
b. The creation of this product should have FMS and there are no plans for a new plant of machinery because this part requires basic manufacturing and assembly methods. This has no effect on our design
c. The product can be constrained to techniques that are similar to crutch manufacturing plants
d. I am open to a new factory, however it is a lot of unnecessary money being spent.

11. Size

a. Must shrink to maximum length of 2 feet and be under 2 cubic feet in volume
b. The minimum size should be the requirements stated above in order to be able to fit in tight spaces and for the purpose of minimizing packaging costs
c. The optimum size for a cane is anywhere from 35-38 inches, but our cane will be telescoping and therefore there will be the option to increases that range without increasing costs too much

12. Weight

a. Maximum 5 pounds for consumer and shipping convenience
b. Minimum of 2.5 pounds for structural integrity purposes

13. Aesthetics and Finish

a. Slim and sleek look
b. Mono-colored (either black and modern or brown and rustic)
c. Smooth metallic touch or wood-like texture depending on which version

14. Materials

a. The piece will be mostly circular aluminum tubing, plastic, and rubber
    i. Tubing: Frame
    ii. Rubber: Comfort on handles and grip with floor
    iii. Plastic: Prongs of legs

15. Product Life Span

a. The product should be able to remain in production for hopefully 8 years because tremors will be able to be stagnated due to the legalization of medical marijuana
b. Because of this product life span, the thing that is most affected is the manufacturing facility because there would be no point to build a whole new facility for a product with a relatively short life span

16. Standards, Specifications, and Legal Aspects

a. The product design will be adjusted to fit all standards and liabilities will be provided after the testing process is complete

17. Ergonomics

a. The man-machine interactions would occur mostly in the assembly process where workers would most likely have to reorient parts or move them from position to position

18. Customer

a. Customers want a lightweight, compact, clean looking, cheap, and functional product that actually improves an aspect in their life.
b. Short delivery time

19. Quality Reliability

a. There should only by 1 defect per 100,000 products
b. Run Safety tests and functionality test multiple times in order to ensure success of the product

20. Shelf Life

a. Shelf Life should be upwards of 10 years. This product does not really decay over time and there are no general environmental conditions that would accelerate decay.

21. Processes

a. There are no specific processes that are vital for the production of this product except possibly welding

22. Timescales

a. The design of the product should last for about 3 weeks after the start dates of the project. After a final design is agreed upon, the prototyping and testing stage should last about 3 weeks after that and once the design is refined and ready for manufacturing, tool and die manufacturing should last no more than a week. The product should be ready to launch in Late December.

23. Testing

a. Test rigidity of stick
    i. Make sure the stick doesn't snap due to the full bodyweight of a person
b. Test rigidity of handles
    i. Make sure the handles don't snap due to the full bodyweight of a person
c. Test frictional force of legs on the ground
    i. Make sure someone cannot apply sufficient force to cause the cane to slip even on surfaces where the coefficient of friction is minimal

24. Safety

a. Our product is a safety product itself and will follow all standard safety standards for consumer products and will be labeled with all possible hazards

25. Company Constraints

a. Our product image should be marketed and modeled as useful and reliable
b. There is more than enough adequate in-house facilities and personnel for the research, design, and development. The project is a very simple idea, but I feel that it is a very useful modification to an already very useful tool.

26. Market Constraints

a. It is of no use to use parts from anywhere except from the North and Central American regions because it would add to cost for starters, but if we use parts from a different country we run the risk of losing business and parts due to political conflicts

27. Patents, Literature and Product Data

a. There are many canes that exist like ours except none of these products have all the qualities in one product like ours does. We have done limited research as to how other patents look, but I think our idea is an original modification.

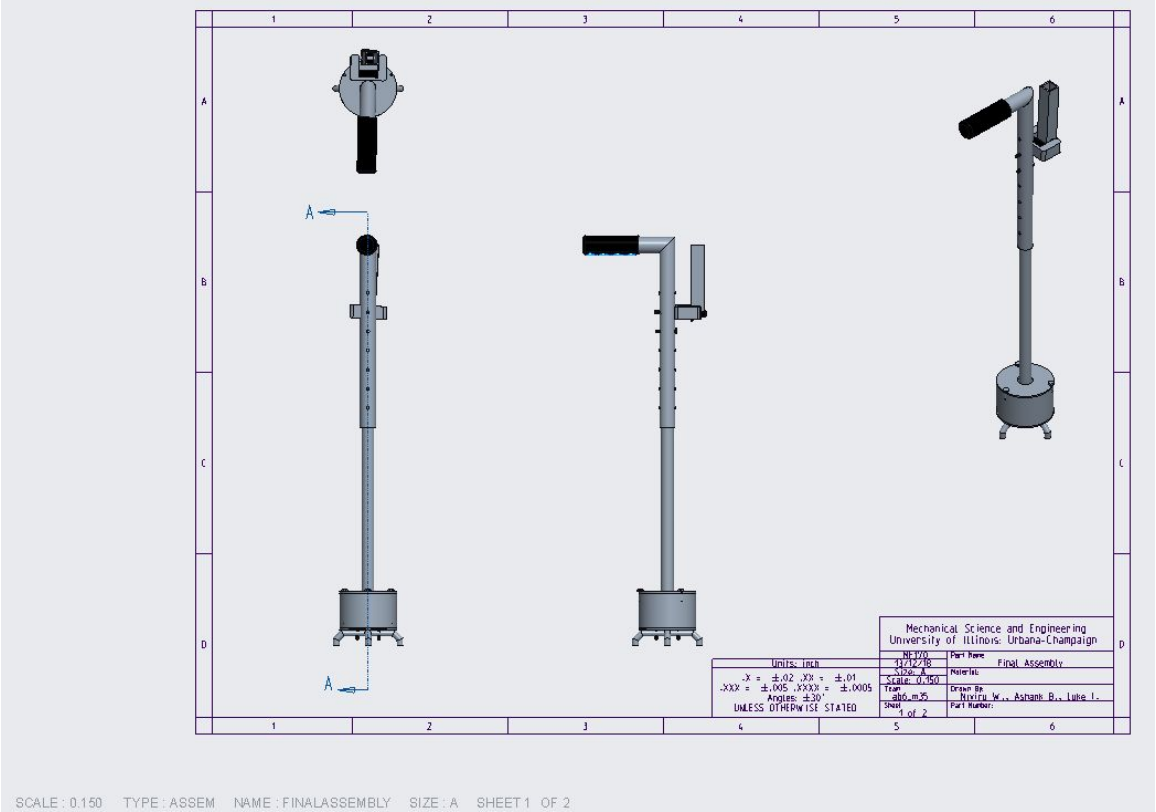
28. Political and Social Implications

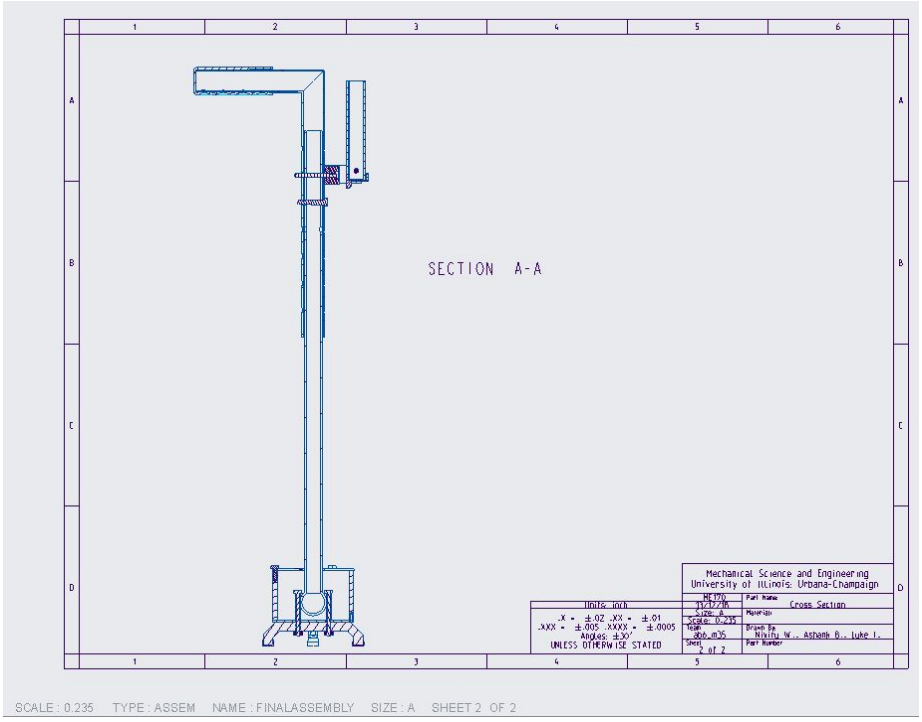
a. This product does not seem to have any political or social implications whatsoever and would not affect consumer movements in the slightest

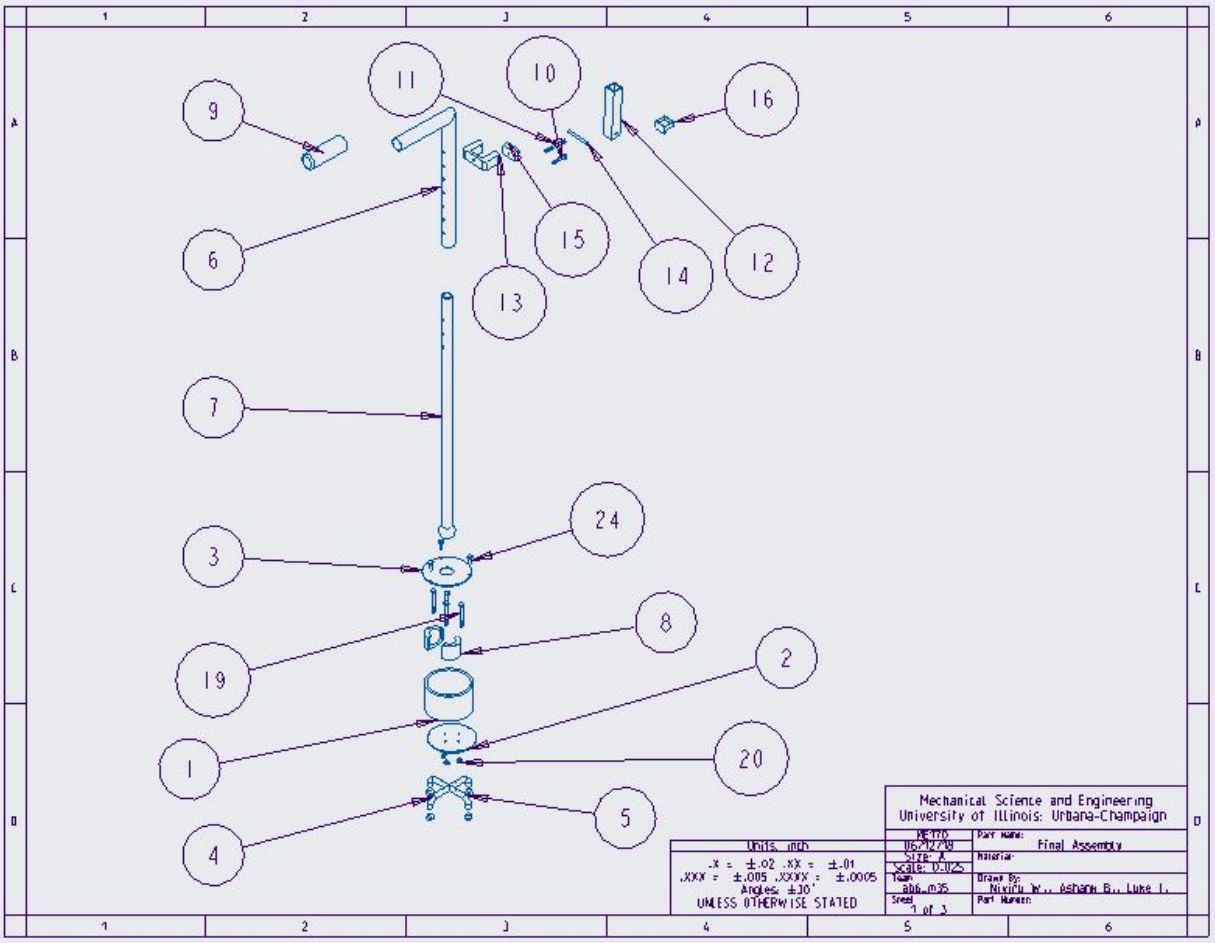
29. Disposal

c. All the metal and the plastic in our product will be able to be recycled and reused
d. We will construct the handles out of rubber which is biodegradable.

Assembly Drawing with Cross Sections/Exploded View







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2	170F-002	1	cylinderbottom.prt
3	170F-003	1	plateconecane.prt
4	170F-101	1	legscane.prt
5	170F-102	4	tabs.prt
6	170F-201	1	lti2_topshaft.prt
7	170F-202	1	project_ballandsocket2-1.prt
8	170F-203	2	project_ballandsocket2.prt
9	170F-401	1	project_canehandle.prt
10	170F-402	1	_cgs_temp_output.prt
11	170F-406	1	2point5incherblueface.prt
12	170F-301B	1	rectsupporthandle.prt
13	170F-302B	1	mounthandle.prt
14	170F-303B	1	rod.prt
15	170F-304B	1	newmountingrubberstop.prt
16	170F-305A	1	recttabssecondaryhandle.prt
17	170F-403A	1	
18	170F-404A	2	
19	170F-405A	4	2375muhfu.prt
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22	170F-407C	1	
23	170F-407D	1	prt0013.prt
24	PRT0001	1	
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Mechanical Science and Engineering
University of Illinois: Urbana-Champaign
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Material:
Drawn By:
Part Number:
2 of 3

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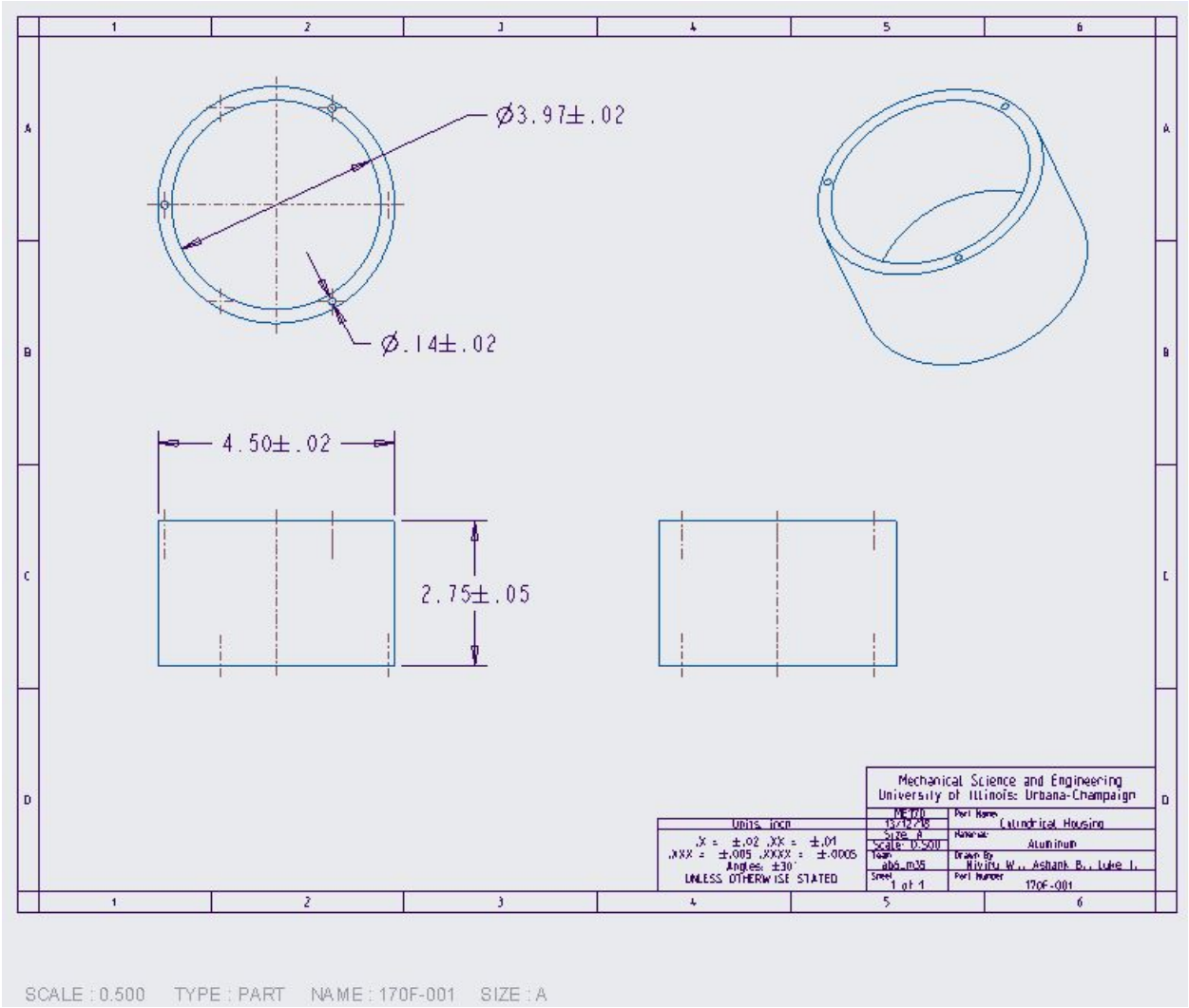
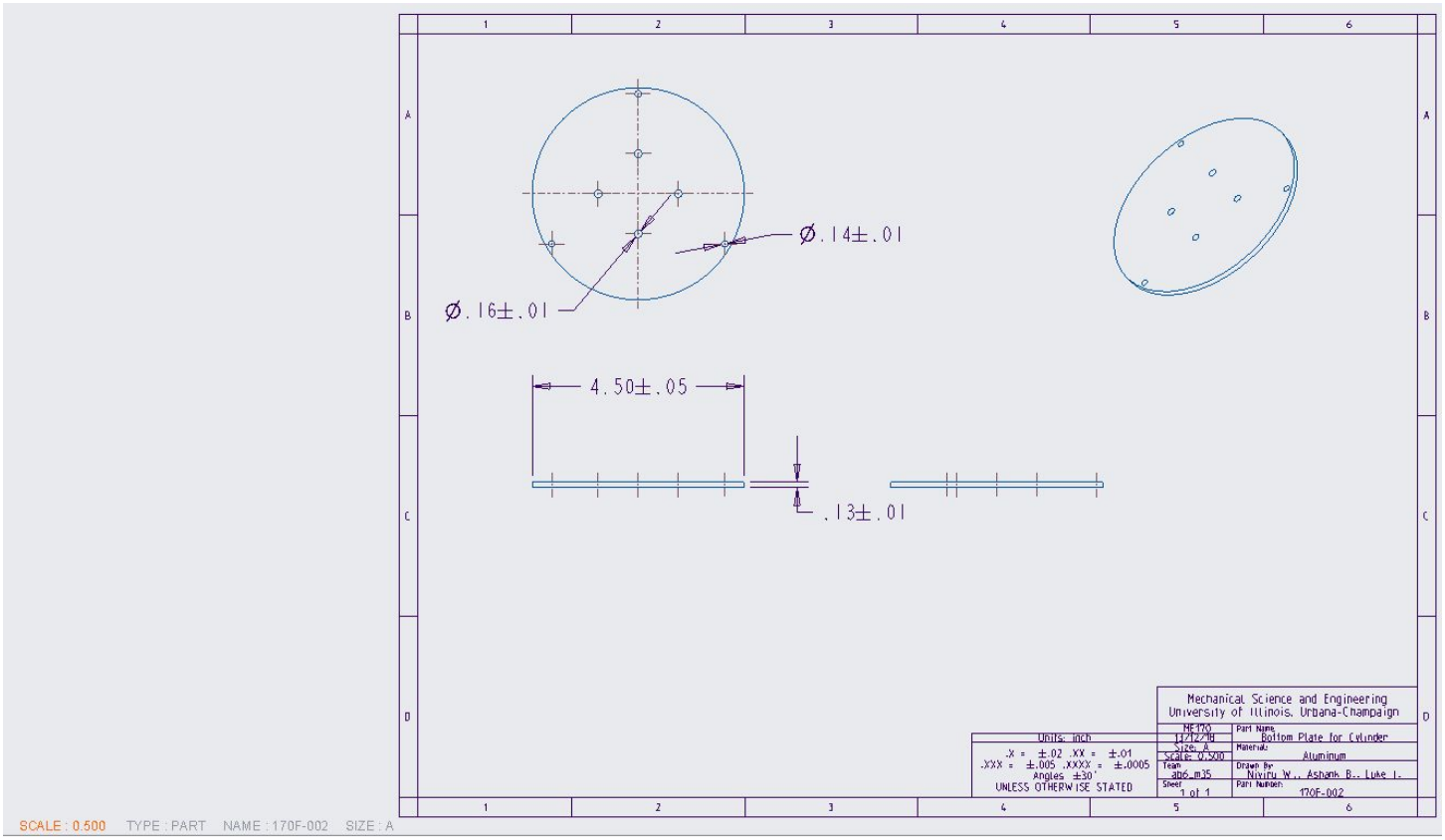
Part Drawings

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12/12/18
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Scale: 0.500
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ab6_m35
Sheet
1 of 1
Mechanical Science and Engineering
University of Illinois, Urbana-Champaign
Part Name
Bottom Plate for Cylinder
Material
Aluminum
Drawn By
Niyifu W., Ashank B., Luke I.
Part Number
170F-002
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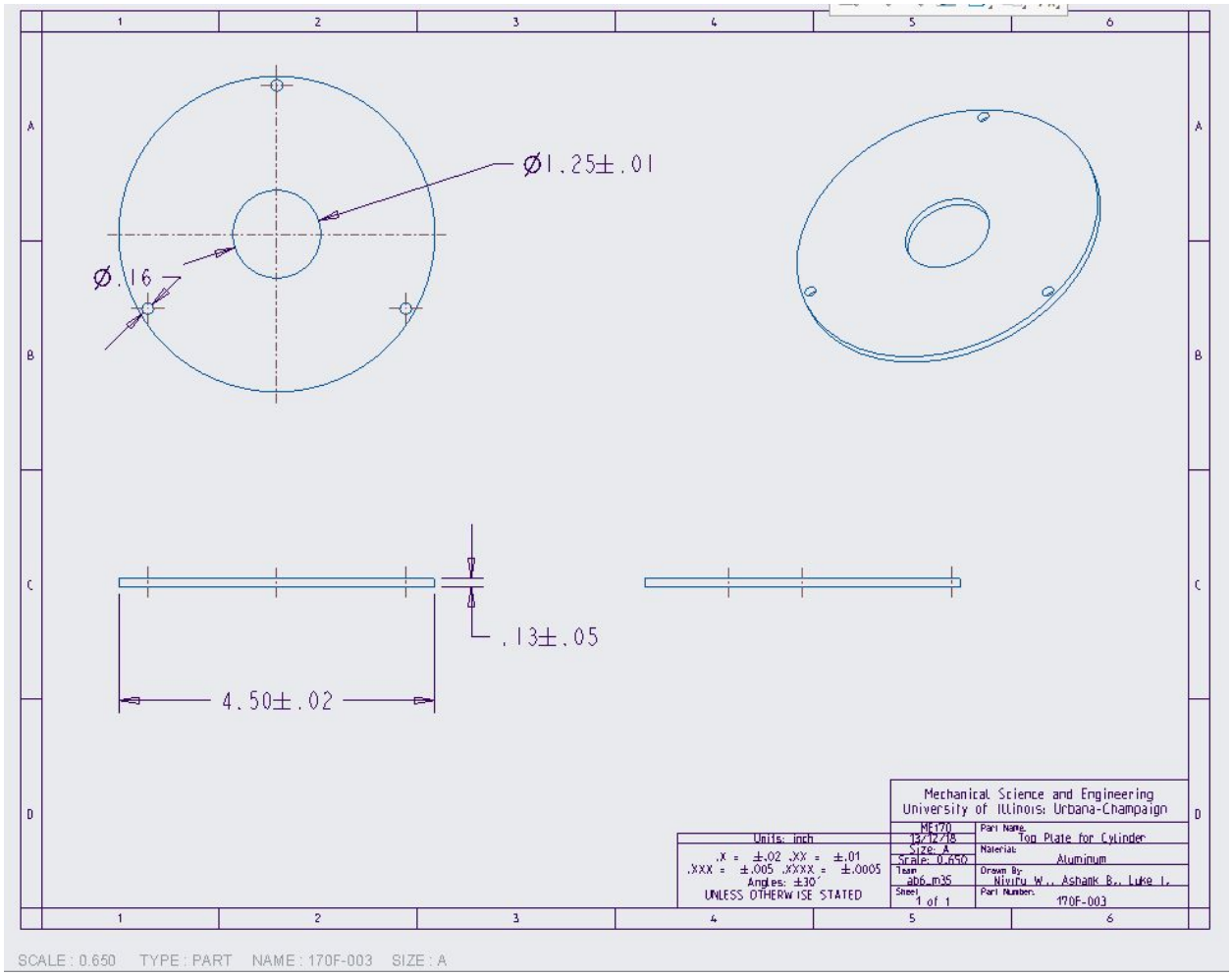
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1 of 1
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University of Illinois: Urbana-Champaign
Part Name
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Drawn By
Niyifu W., Ashank B., Luke I.
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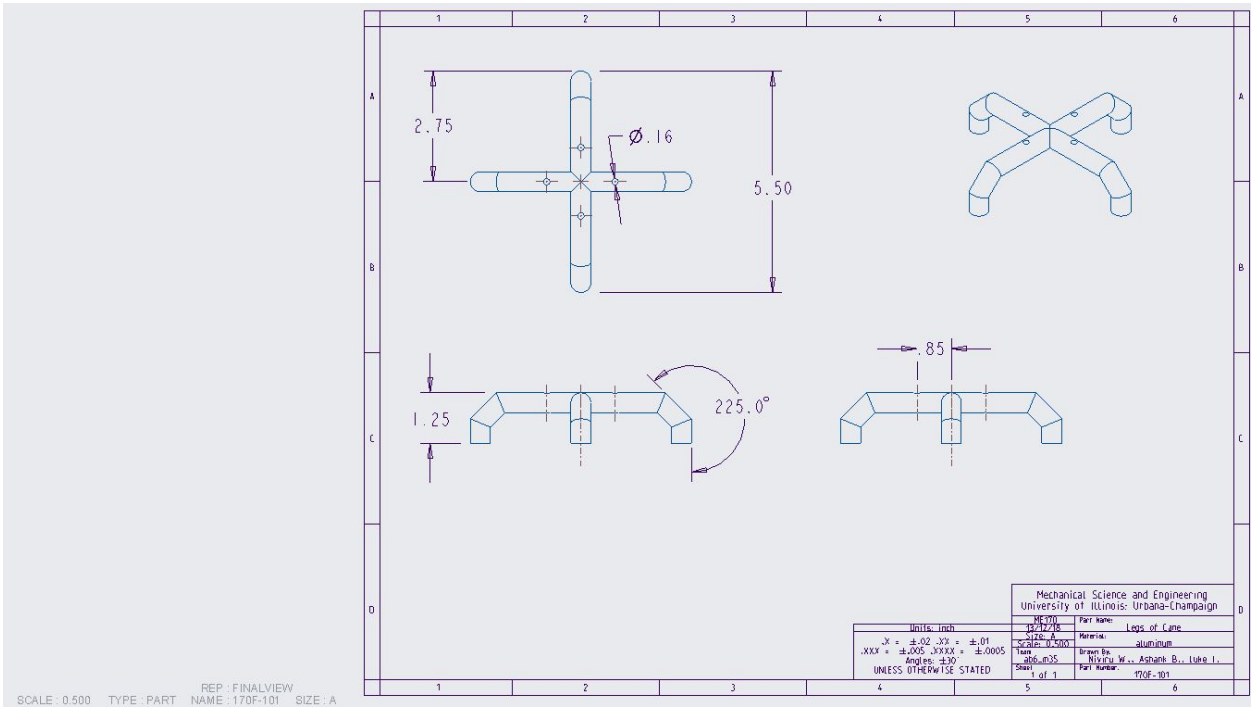
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Team abb_m35
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Part Name: Legs of Cane
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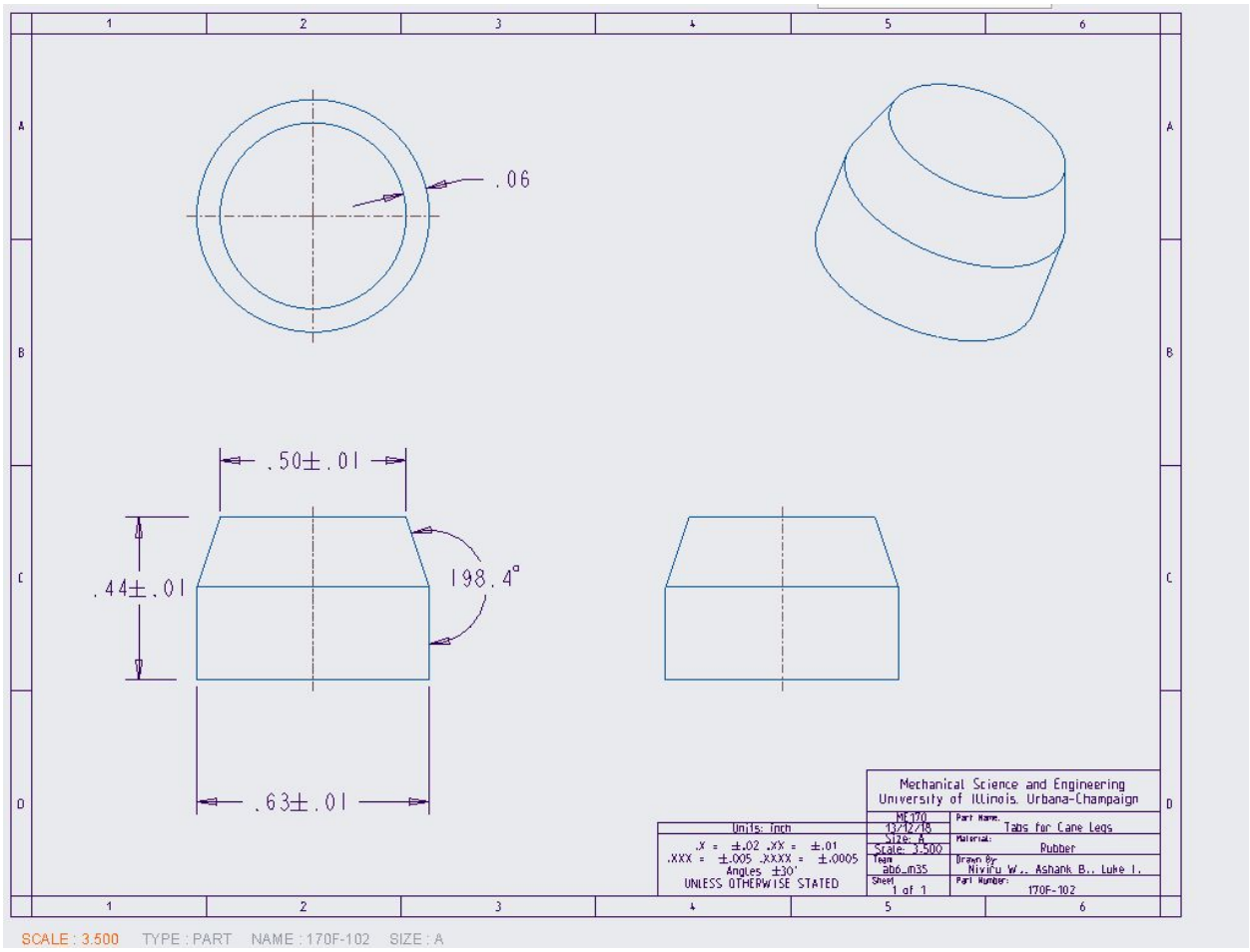
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Team abb_m35
Sheet 1 of 1
Part Name: Tabs for Cane Legs
Material: Rubber
Drawn By Nivinu W., Ashank B., Luke I.
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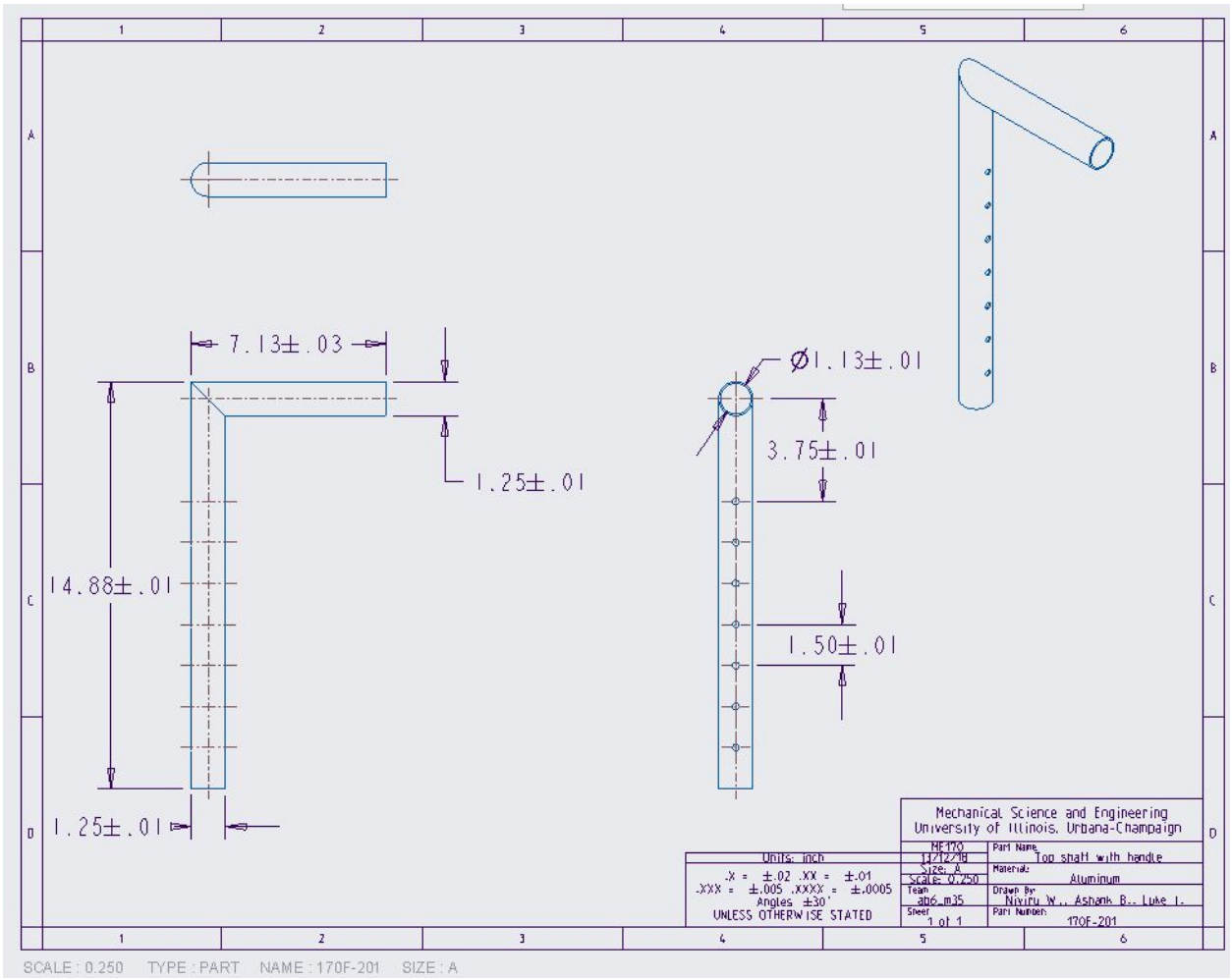
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University of Illinois, Urbana-Champaign
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11/12/98
Size: A
Scale: 0.250
Team ab6_m35
Sheet 1 of 1
Part Name: Top shaft with handle
Material: Aluminum
Drawn By: Niviru W., Ashank B., Luke I.
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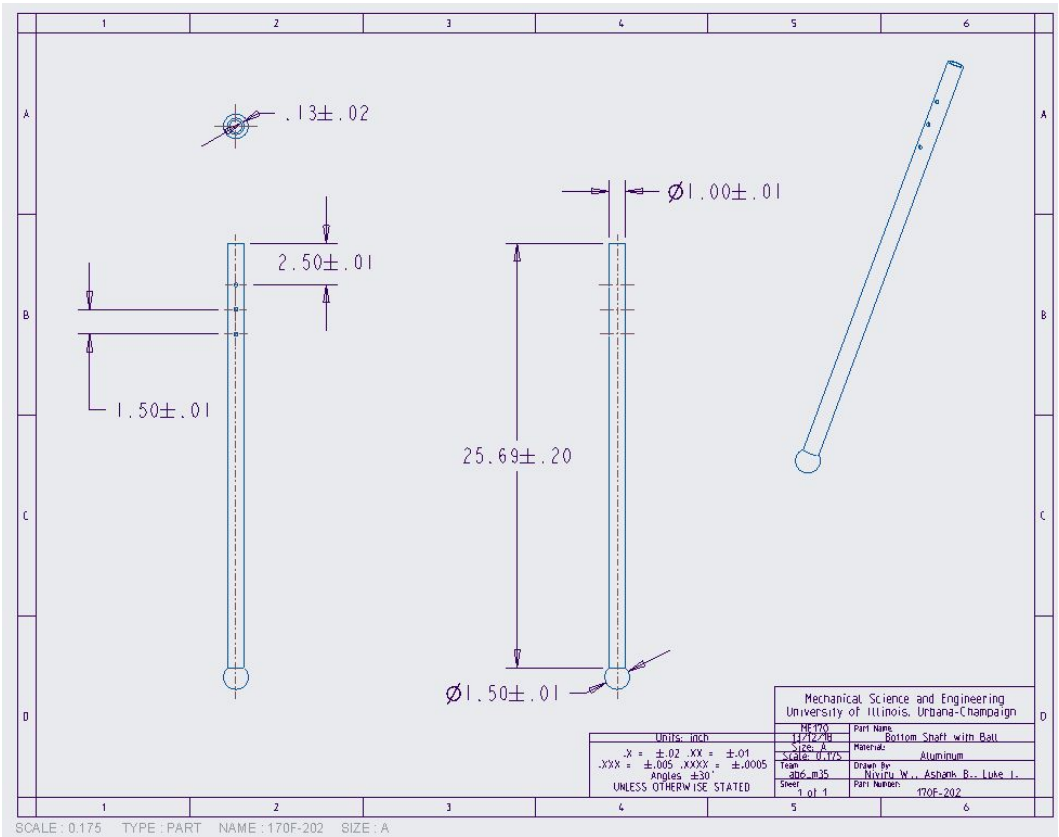
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University of Illinois, Urbana-Champaign
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Angles ±30'
UNLESS OTHERWISE STATED
ME170
11/12/98
Size: A
Scale: 0.175
Team ab6_m35
Sheet 1 of 1
Part Name: Bottom Shaft with Ball
Material: Aluminum
Drawn By: Niviru W., Ashank B., Luke I.
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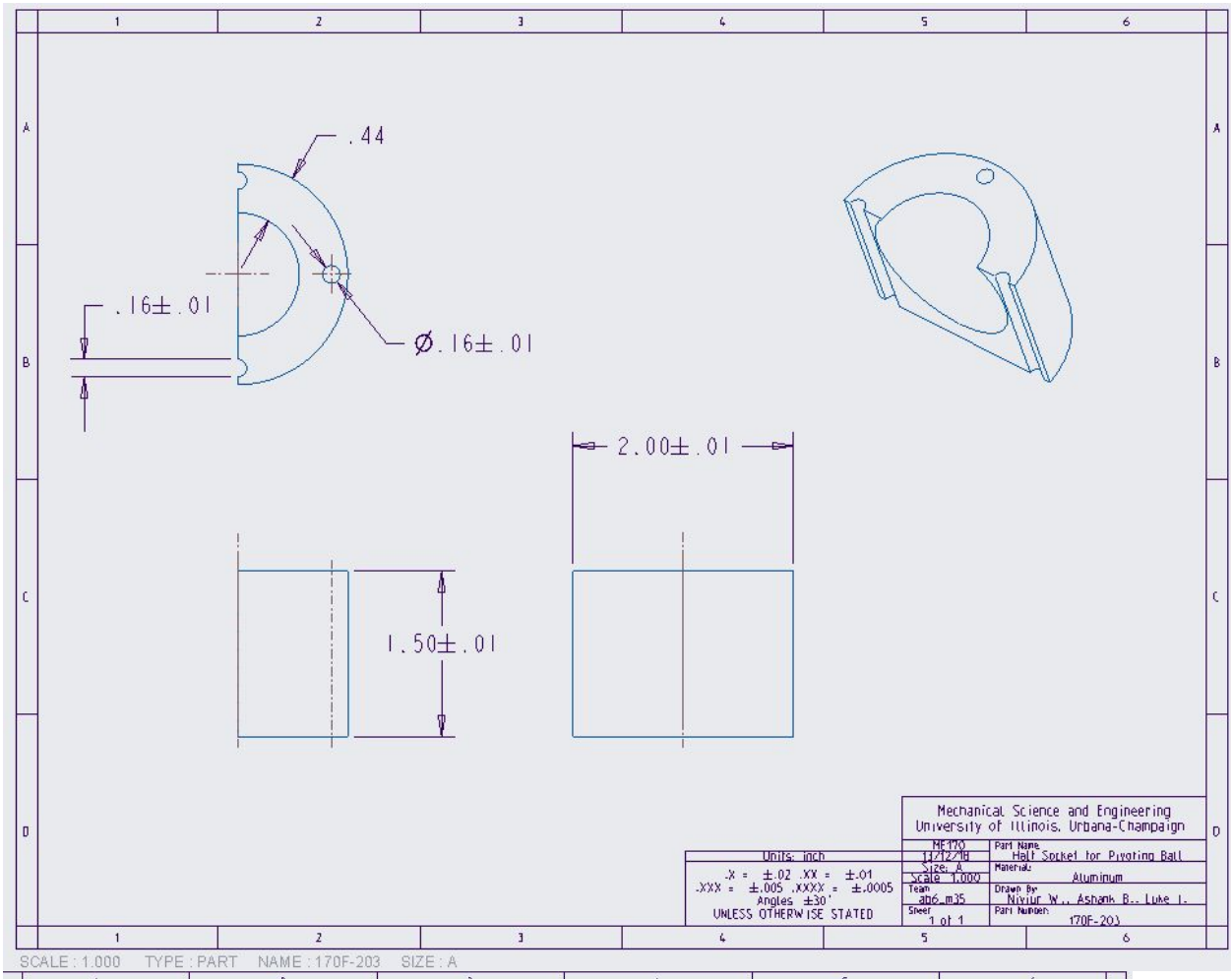

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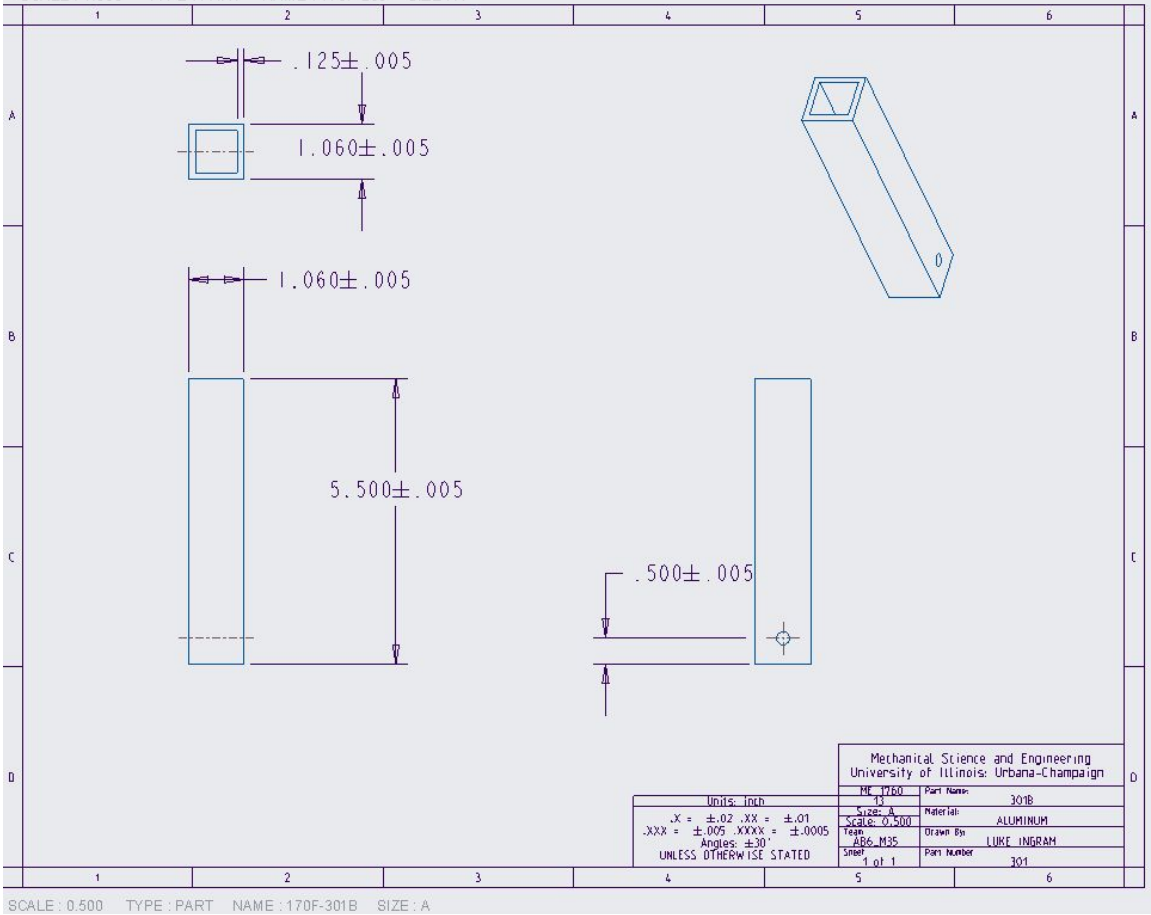

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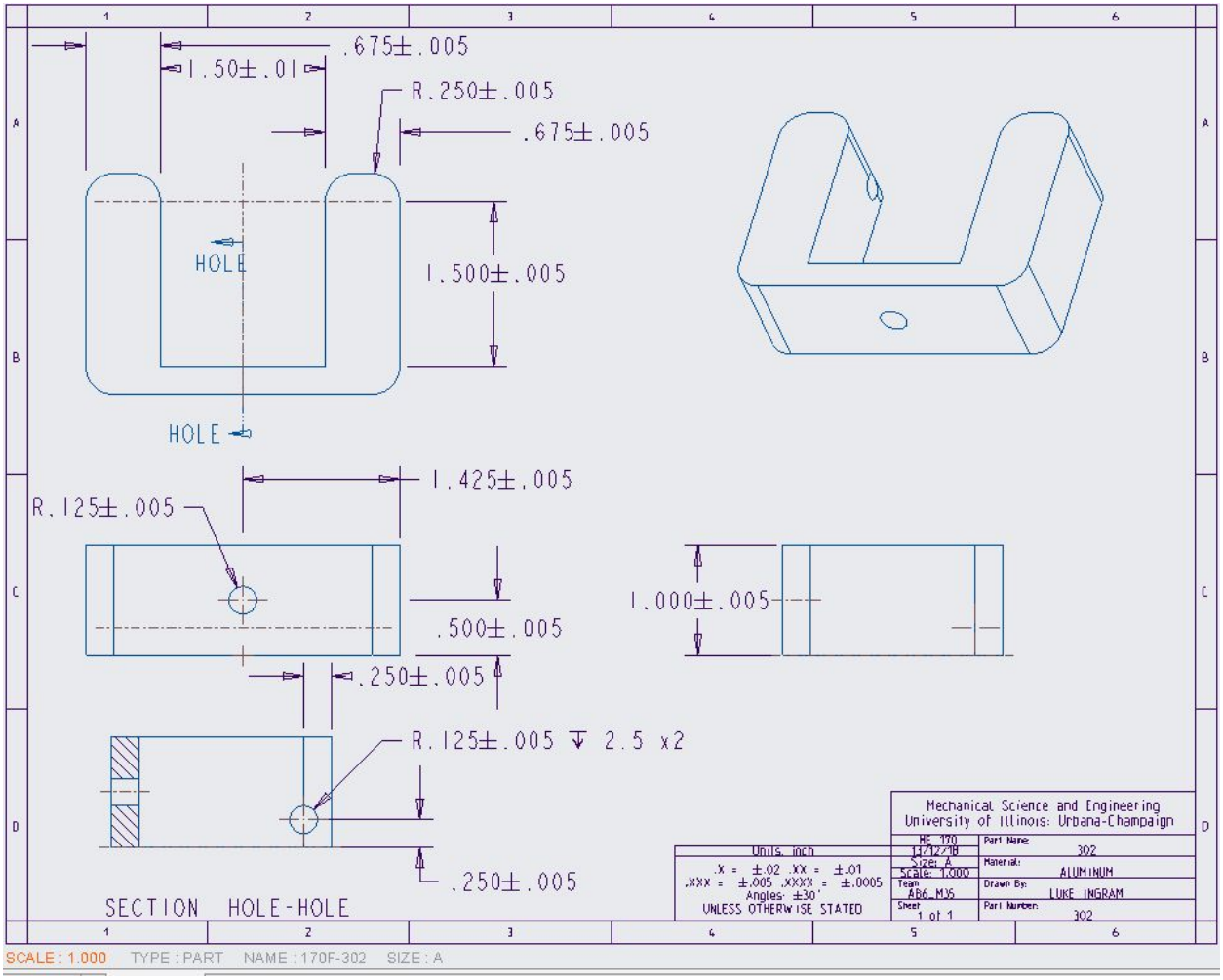
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University of Illinois: Urbana-Champaign
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Drawn By: LUKE INGRAM
Part Number: 302
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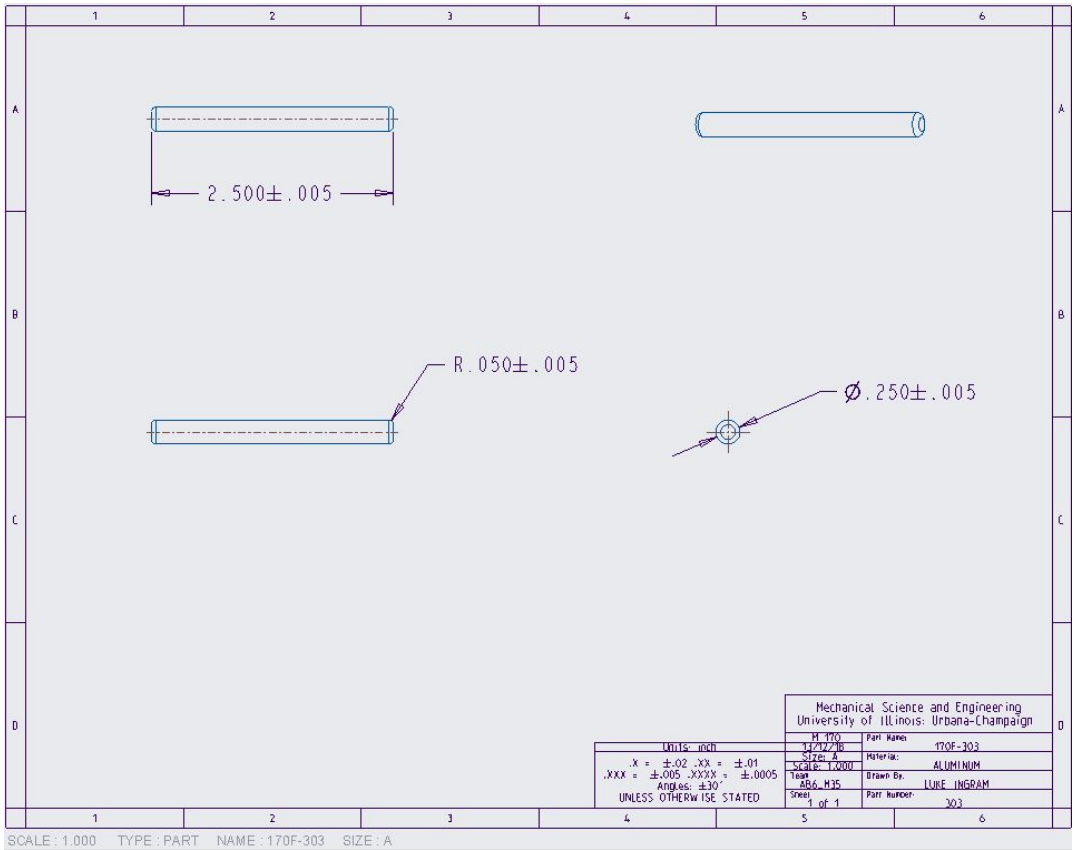
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Part Number: 303
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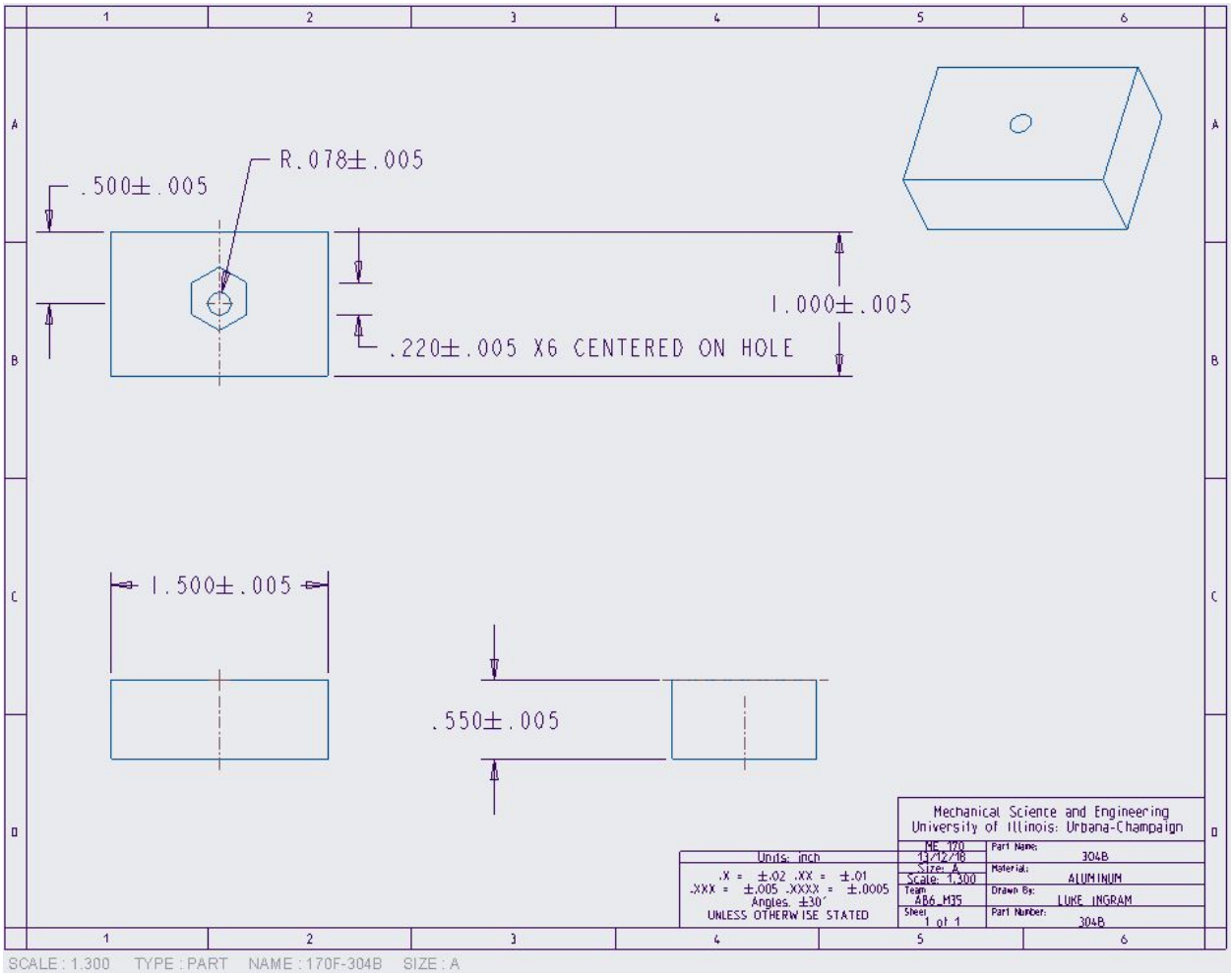
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Drawn By: LUKE INGRAM
Part Number: 304B
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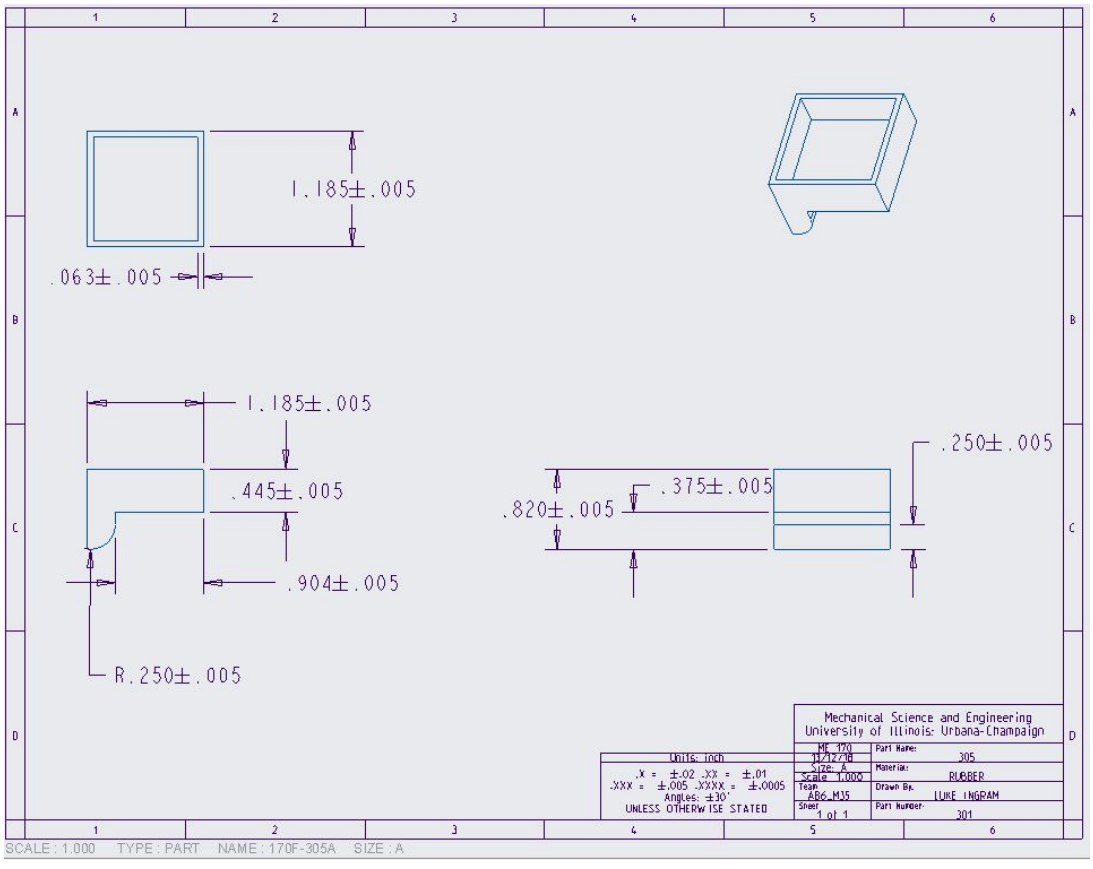
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11/12/18
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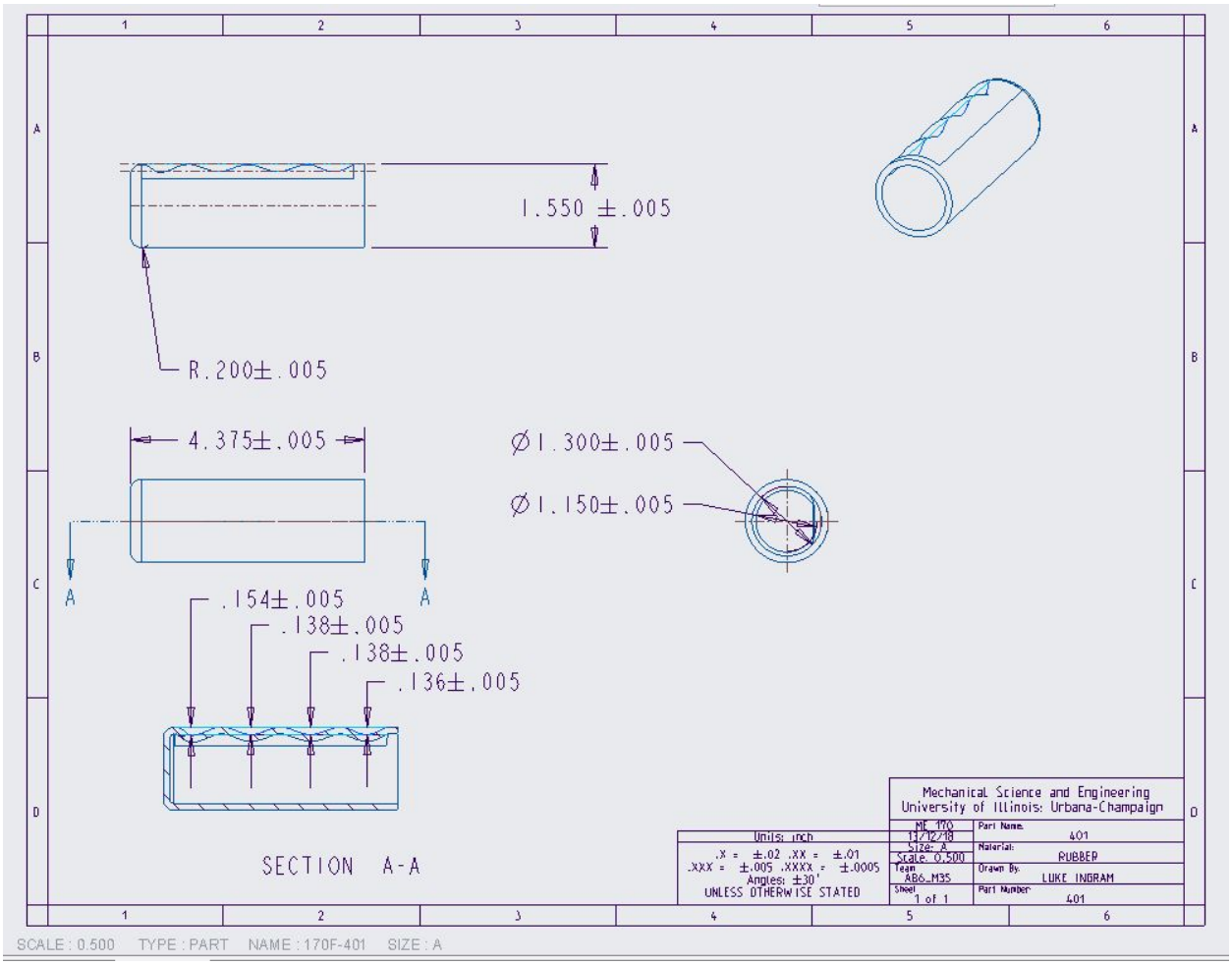
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University of Illinois: Urbana-Champaign
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1 of 1
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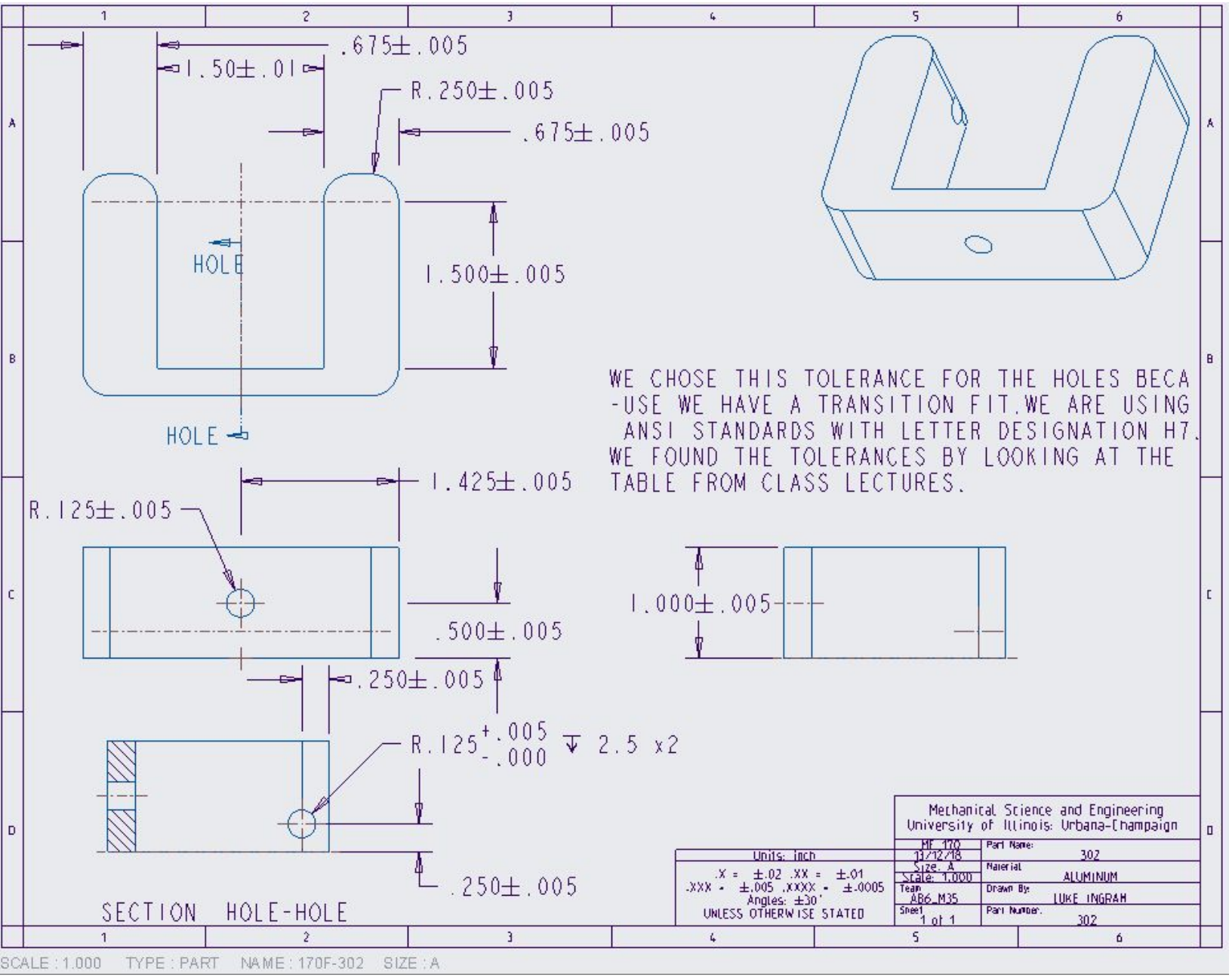
Tolerance Analysis



Materials and Manufacturability

	Part Name	Part Number (catalog name)	Material: Process	Material Cost (aPriori/MMC)	Quantity
1					
2	Cylindrical Housing for Ball and Socket	170F-001	Aluminum: Die Casting	$3.08	1
3	Bottom Plate for Cylinder	170F-002	Aluminum: **Roto** and Blow Molding	$0.28	1
4	Top Plate for Cylinder	170F-003	Aluminum: **Roto** and Blow Molding	$0.28	1
5					
6	Legs of Cane	170F-101	Aluminum Tubing: Compression/Ram Bending/UserGuided	$0.23	1
7	Tabs of Cane	170F-102	Rubber/Plastic: Injection Mold/ Rubber Coating	$0.02	4
8					
9	Top Shaft with Handle	170F-201	Aluminum Tubing: Compression/Ram Bending/Circular Saw	$0.47	1
10	Bottom Shaft with Ball	170F-202	Aluminum Tubing: Compression/Ram Bending/Circular Saw	$0.92	1
11	Socket for Pivoting Ball	170F-203	Aluminum: Die Casting	$0.10	2
12					
13	Secondary Handle	170F-301B	Aluminum Tubing: Bend Break/Tubing	$1.32	1
14	Mounting for Secondary Handle	170F-302B	Aluminum: **Roto** and Blow Molding	$0.49	1
15	Pivot Rod	170F-303B	Aluminum Rod: Circular Saw/ End Forming	$0.01	1
16	Rubber Stop on Handle Mount	170F-304B	Rubber/Plastic: Injection Mold/ Rubber Coating	$0.15	1
17	Rubber Stop on Handle	170F-305A	Rubber/Plastic: Injection Mold/ Rubber Coating	$0.15	1
18					
19	Grip Handle	170F-401	Rubber/Plastic: Injection Mold/Rubber Coating	$0.20	1
20	1/4" 20 Bolts 1.5	170F-402 (McMasterCarr)	Off the shelf	$0.13	1
21	#8 Machine Screws	170F-403 (McMaster Carr)	Off the shelf	$0.29	4
22	#6-32 Wing Nut	170F-404A(McMaster Carr)	Off the shelf	$0.37	2
23	1/4" 20 Bolts 2.375	170F-405(McMaster Carr)	Off the shelf	$0.13	4
24	1/4" 20 Bolts 2.5	170F-406(McMaster Carr)	Off the shelf	$0.13	1
25	1/4" 20 LockNuts	170F-407(A-D)(McMaster Carr	Off the shelf	$0.14	6
26					
27					
28					
29					
30					
31	Total Investments =	$41595.58*			
32			Total Fully Burdened Piece Part Costs =	$9.28*	
33		*(According to aPriori)			