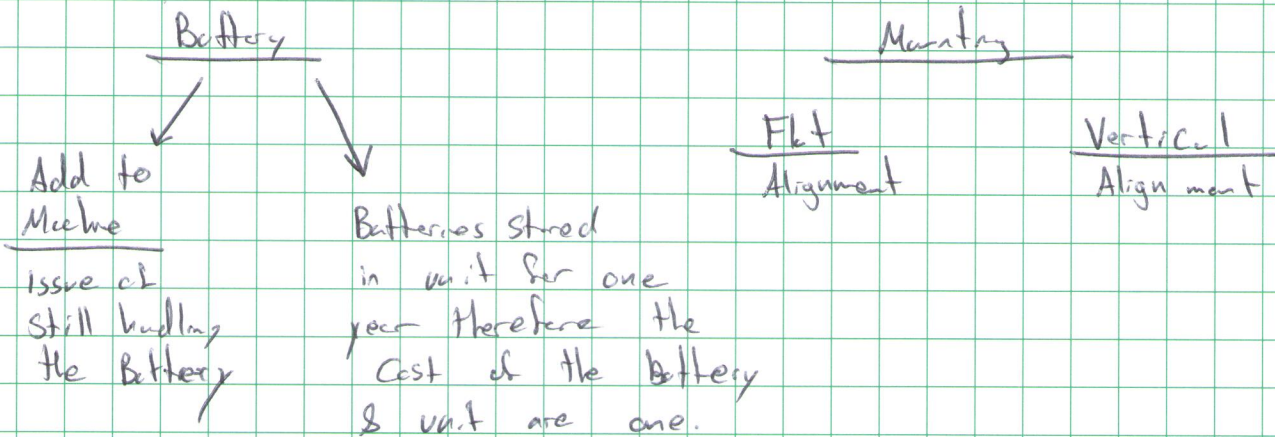
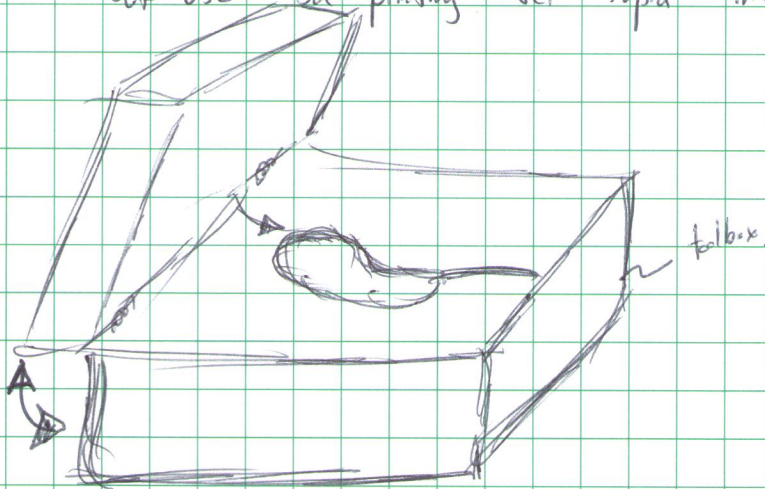


→ Storming Since single battery may be a pain in the neck design a machine that has the batteries already inside.

FDM  
Fused deposition Modeling.



Main manufacturing Method is injection Molding most likely, but use 3d printing for rapid manufacture



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*[Signature]*

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Functional Requirement	Design Parameter	Analysis	<del>Ref</del> Ref	Risks & CM
<p>Design Battery Loading (Single or Volume)</p> <p>Only needed for one single unit.</p>	<p>Battery size (locked)</p> <p>Mounting</p> <p>Flat or Vertical</p> <p>closing of Box. Actuates or other Mechanism</p>	<p>Force to open</p> <p>empty</p>		

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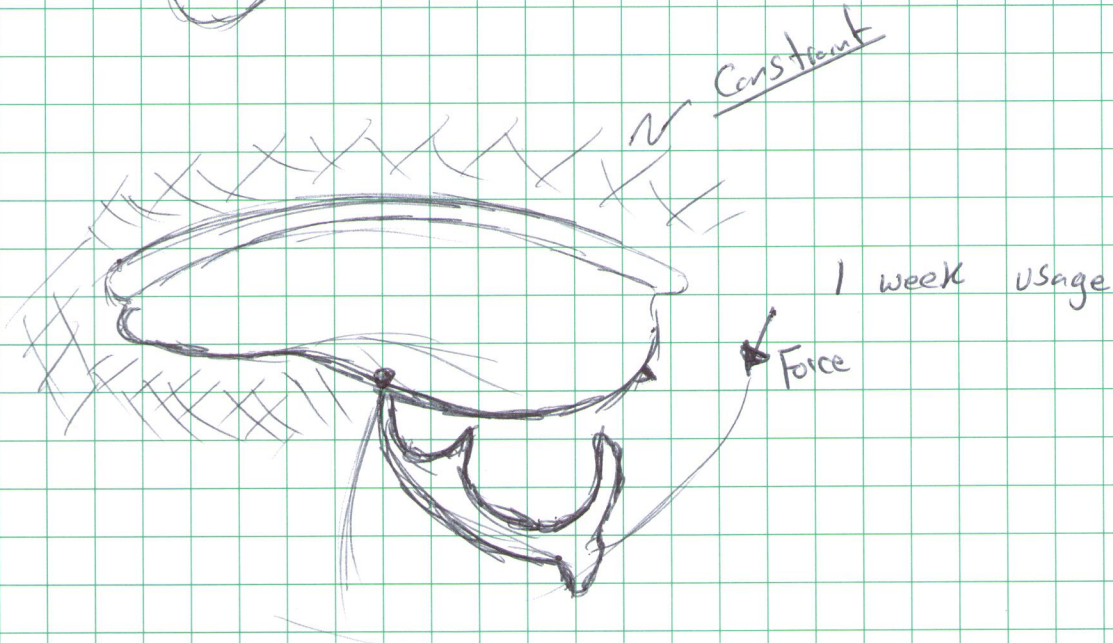
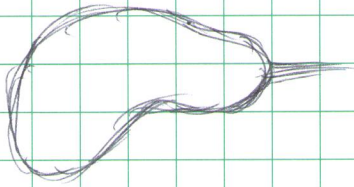
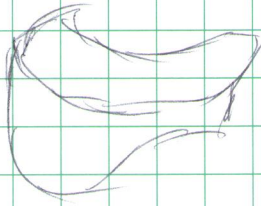
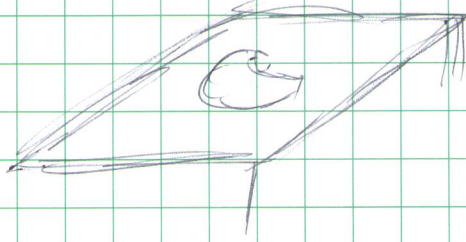


20130702

25-5N

Get Direction of  
unit

1/4



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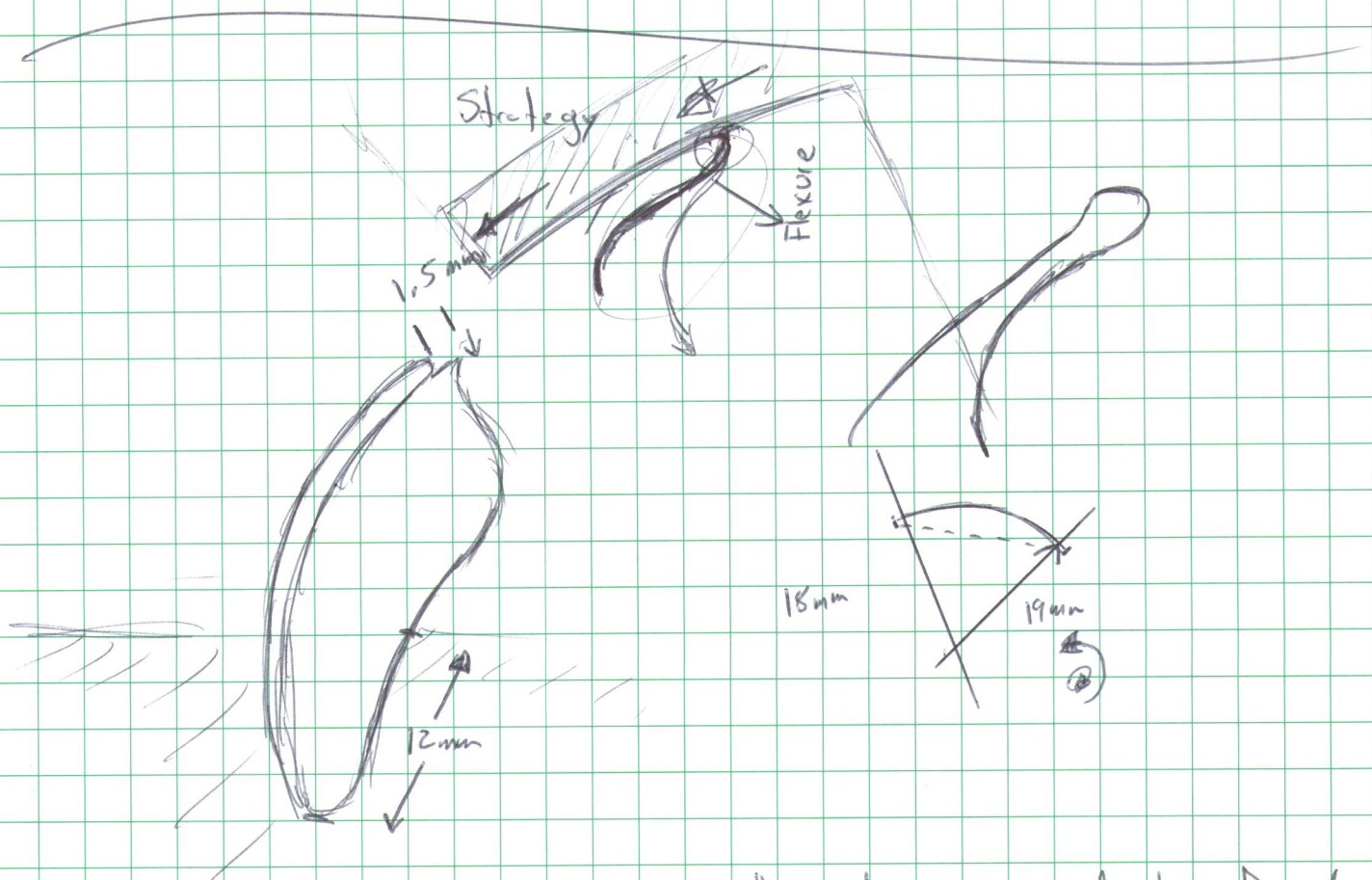
Date

Things to do

Market Design 2-3 hrs  
Mechanics

Equations of motion of hinge mechanism.

① Develop strategy



other options proposed by David



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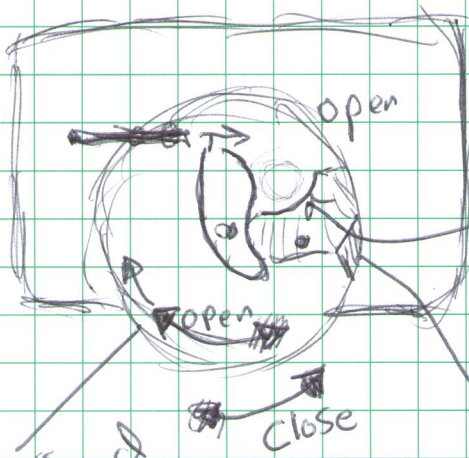
Date



Cam activation

Process

- Place



Cam is also used to close the unit.

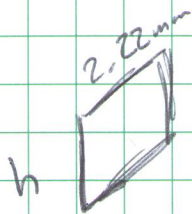
setup trigger remove to Battery

Considerations

No Flexures since i'm 3D printing

Gear may 10 Newton

gear  
R 11.9063mm diam  
D = 23.8125



ABS  $\sigma_y \approx 40$

Nylon 70 MPa



range

Injection  
molding

polypropene  
40 MPa

$\approx \frac{1}{3}$  10 MPa

$$\frac{10 \text{ N}}{0.0022 \times h} = 15 \text{ MPa}$$

only need  
0.3 mm

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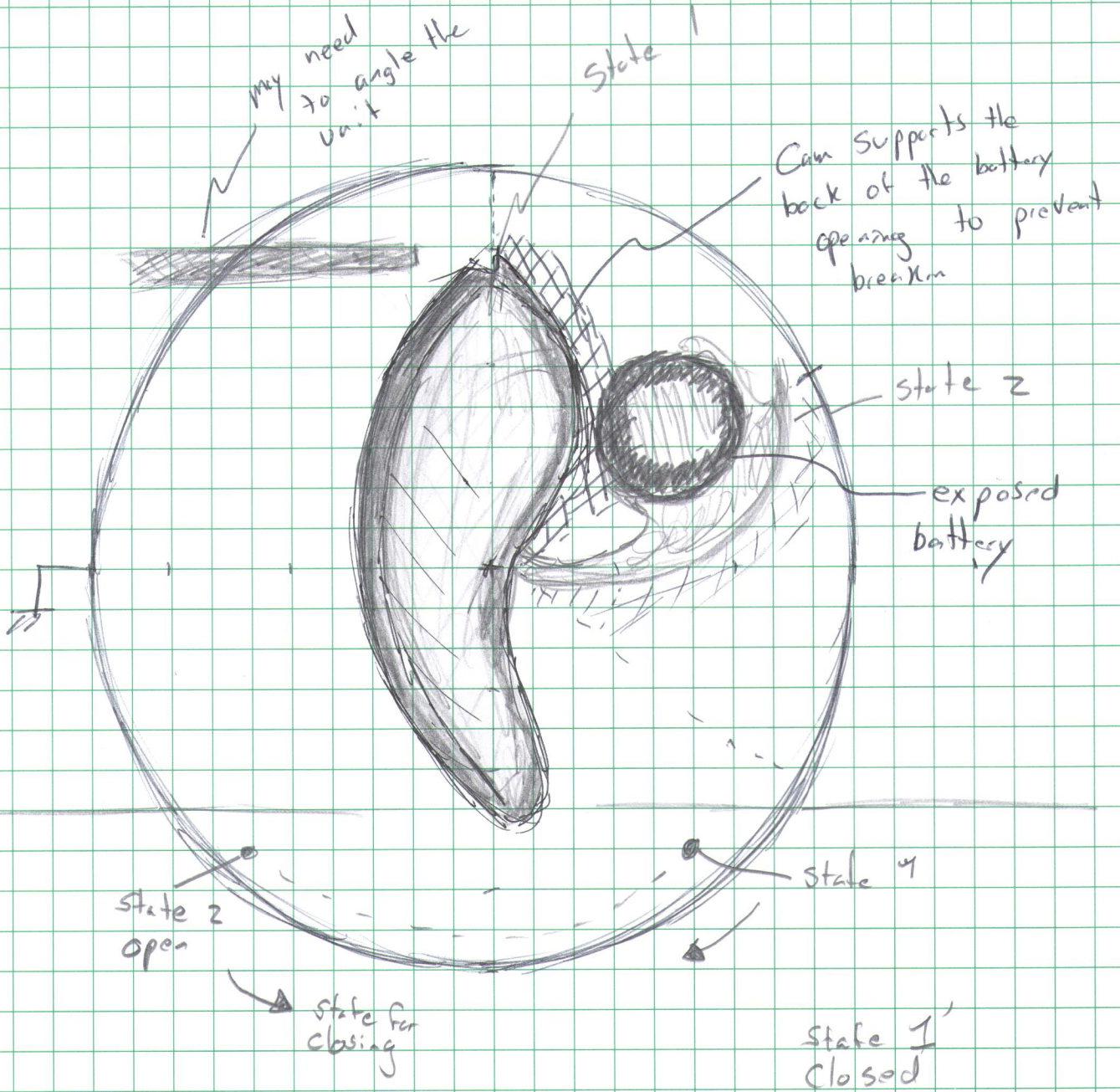
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20120702/03

Import Cad drawing gives to Omax & create bearing and CAD & actual size just in case we need one for the printing job.

→ Adjust Scales  $230.08 = 10 \text{ mm actual}$

$$\frac{1}{23} = 0.043478$$

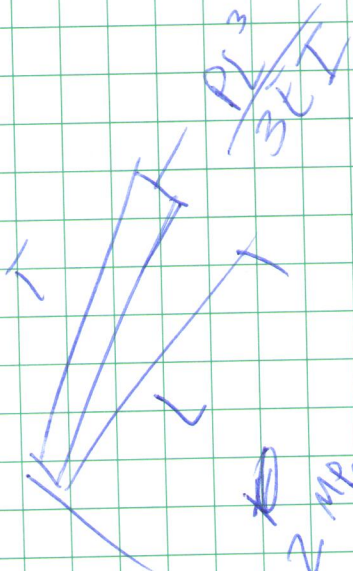
$$x = 127.45 \text{ m}$$

$$y = 113.50$$

convert to

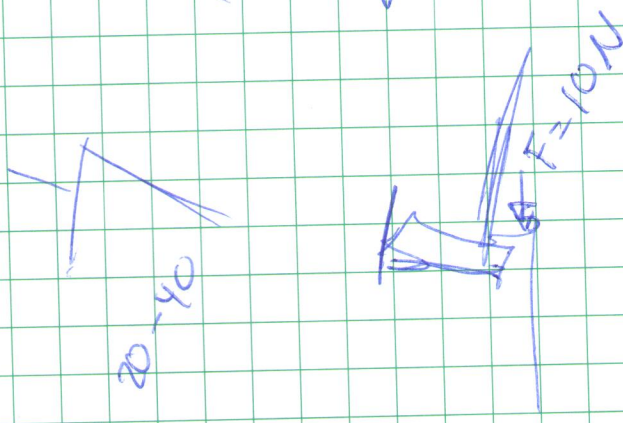
$$23.71 \text{ cm}$$

$$\frac{1}{13.3209}$$



corner 0.6309

- gap
- 1.69 mm
- 1.67
- 1.81
- 1.70 mm
- 3.34/2



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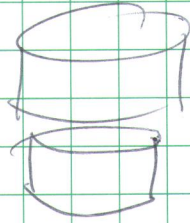
Date \_\_\_\_\_

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Date \_\_\_\_\_

8:57 Keep tracking

9:16 Design work



two disk motor

- Battery

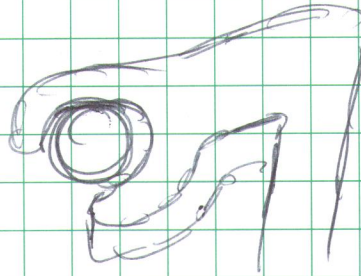
5.62mm

Analysis  
M

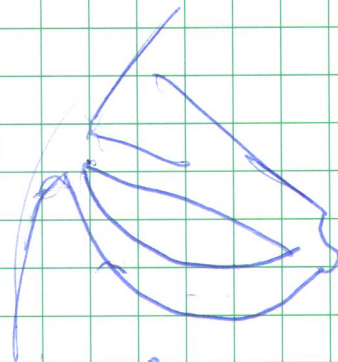
57. 10 mntas

Start 10:37 print  
11:40

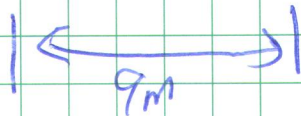
@85



16.1752



8.9



- ✓ - Make Holes on arsel
- Clip design to hold piece
- guiding

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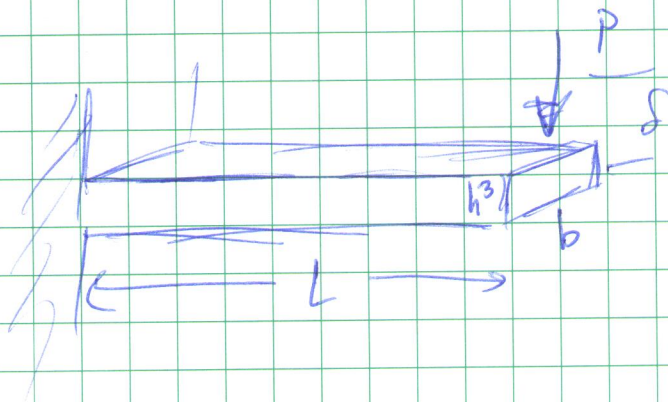
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Date





$$\delta = \frac{PL^3}{3EI}$$

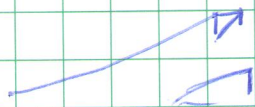
$$E_{st} = 210 \text{ GPa}$$

$$\sigma_y = 40 \text{ MPa}$$

$$I = \frac{1bh^3}{12}$$

$$E_{st} = 210$$

$$E_A = 70$$



$$= \frac{4PL^3}{8 \frac{(0.002)h^3}{12}}$$

$$b = 0.002$$

Fixed because of size

I want  $\delta$  to be roughly 1/1000 h

$$\delta = \frac{4PL^3}{0.002 h^3}$$

$$h = \frac{4PL^3}{0.002 h^3}$$

$$\frac{2 h^4}{1000} = 4PL^3$$

L must be 5 to 10 h

$$\frac{2}{1000} h^4 = 4P(5h)^3$$

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$$M = PL$$

$$0.002 h^4 = 500 P h^3$$

$$M = KIE$$

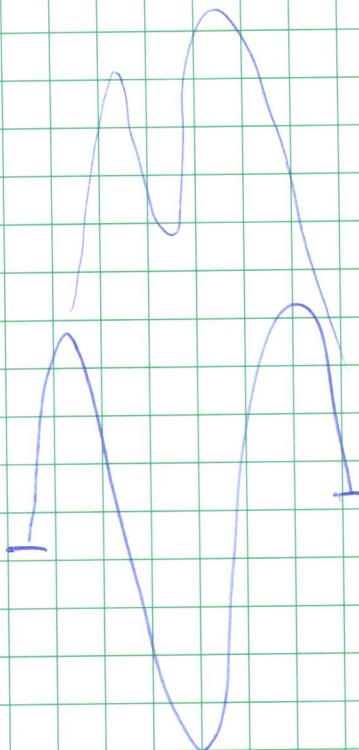
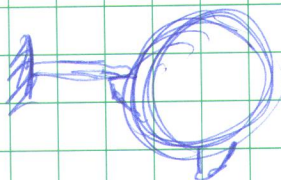
$$0.002 h = 500 P$$

$$(500)(10)$$

$$z \quad \sigma_y =$$

$$0.002 h = 5000$$

$$h =$$



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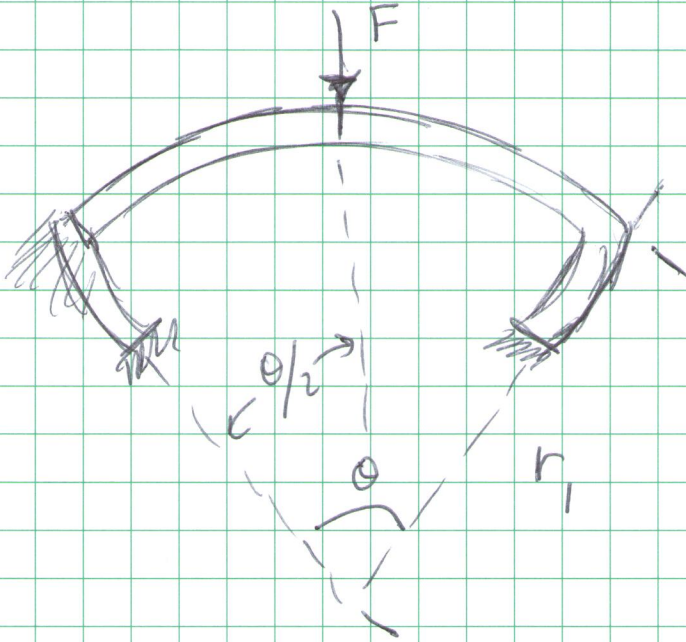
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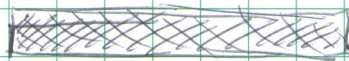
$$M_p = \frac{bd^3}{4} \sigma_y$$

20 Midnight working on Analysis



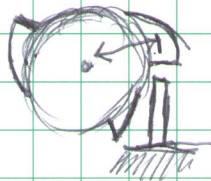
$$s = r\theta$$

$$M = PL$$



$$r_{buckle} = F_B r_c$$

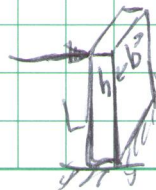
Load Lock



$$F_{Buckle} = \frac{CEI}{L^2}$$

$$F_B = \frac{CEbh^3}{12L^2}$$

$$r_{buckle} = \frac{CEbh^3}{12L^2} \cdot r_c \approx 10$$



$$\frac{bh^3}{12}$$

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Lecture

Sören Stranne (Innovation Lecture)

- How to stimulate in a larger company?

User feedback

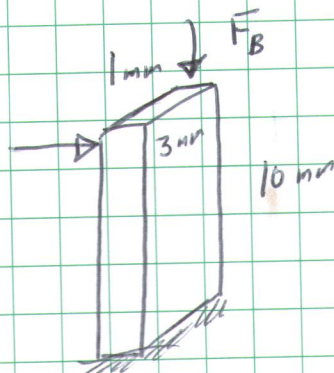
→ Locking  Flexure

→ Single location

$$\tau_{buckle} = \frac{10 \cdot 10^9 \cdot 3 \cdot 10^{-3} \cdot (1 \cdot 10^{-3})^3}{12 \cdot (10^{-2})^2}$$

$r = 10 \text{ mm}$

$$\frac{10 \cdot 10^9 \cdot 3 \cdot 10^{-3} \cdot 10^{-9} \cdot (r_c)}{12 \cdot 10^{-4}}$$



$$= \frac{10 \cdot 10^9 \cdot 3 \cdot 10^{-3} \cdot 10^{-9} \cdot r_c}{12 \cdot 10^{-4}}$$

$$\frac{30 \cdot 10^{-3} \cdot r_c}{12 \cdot 10^{-1}}$$

$$\tau_{buckle} = \frac{30}{1.2} \cdot r_c$$

50       $0.5 \cdot 10^{-1}$

$$\tau_{buckle} = \frac{30}{5} \cdot 15 \cdot 10^{-3}$$

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360 · 10<sup>-3</sup>

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$\frac{5}{4}$

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Date

0.36 *N.m*

Signed

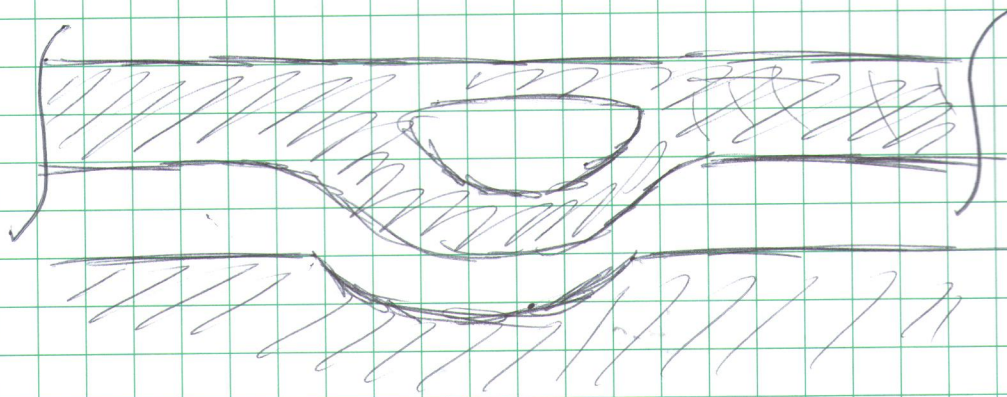
$\frac{120 \cdot 15}{5}$

Date

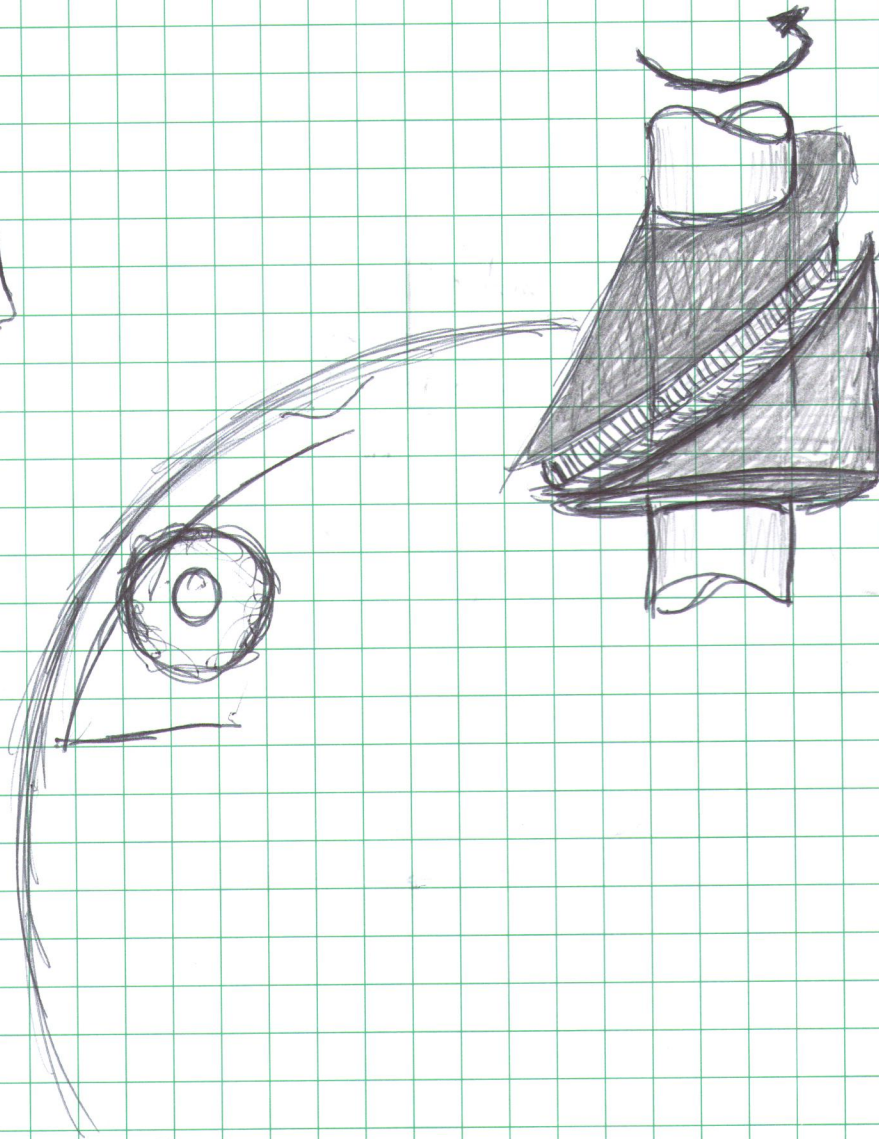
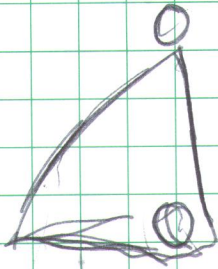
0.015







also provides  
a preload.



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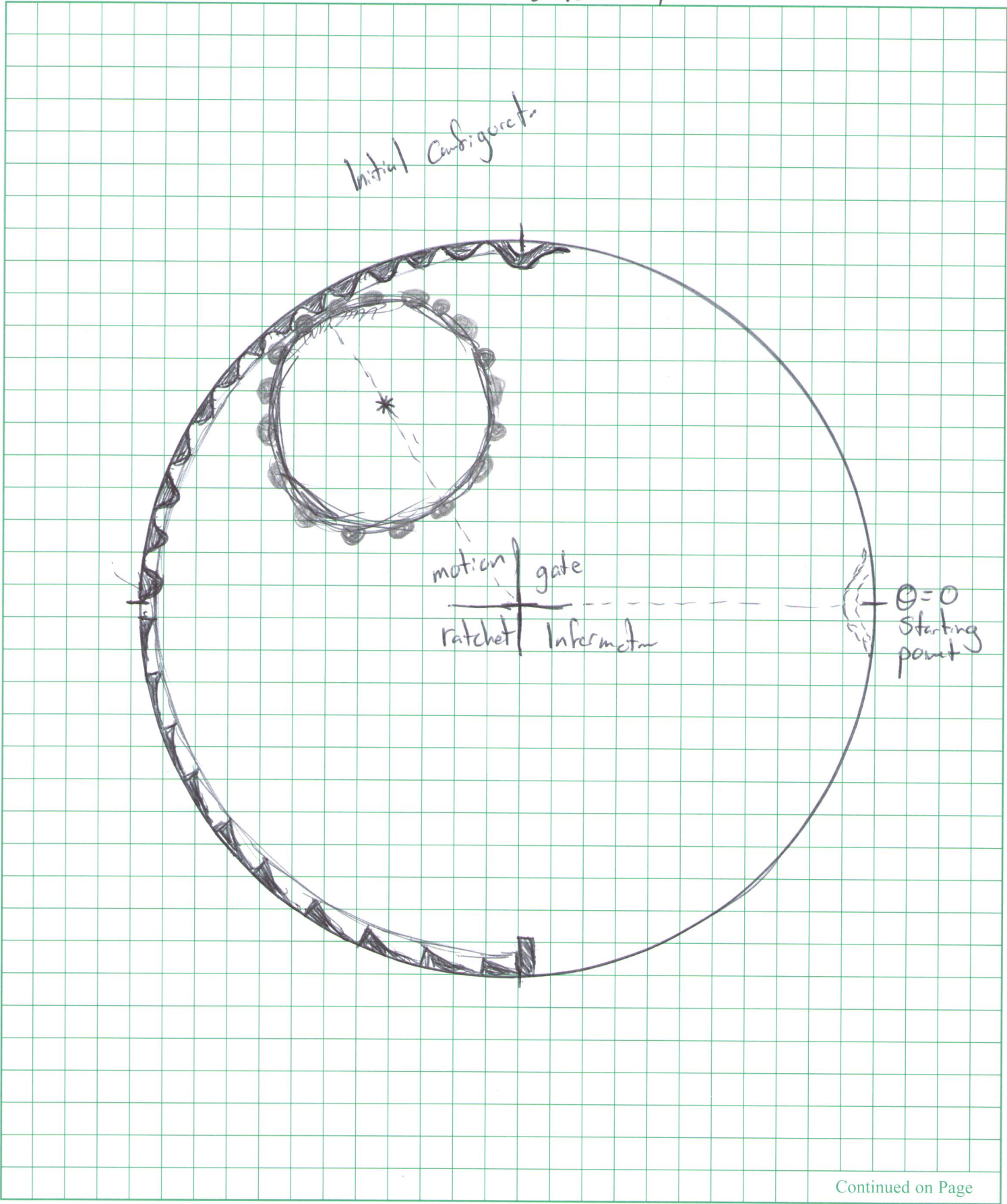
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20130705

Summary

> Give presentation on Design process to get teams working together. Encourage individual to come up with solutions & then discuss in group.

> Encourage use of design notebooks, & Analysis

> Separate into a 3D event

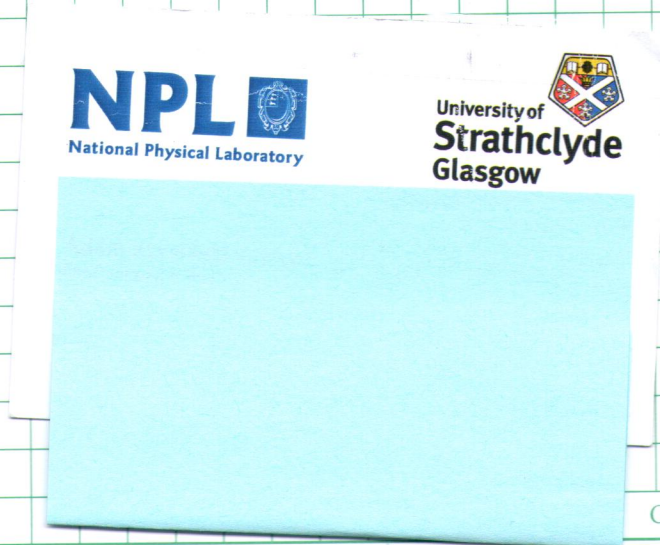
Day 1: arrive problem & design (& appropriate analysis)

Day 2: Manufacture Components & testing.

Day 3: Presentation & 20 minutes present process & analysis associated with design  
(Evening awards)

- Manufacturing
- Materials & processing
- 

> Collect design notebooks for documenting ideas & process



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Date \_\_\_\_\_