Date: 2/4/2024 [start]

Meeting Objective: Establish Team Roles

Stacy – Force Analysis

Brandon - Connection Method

Teagan - Assembly

- [End]

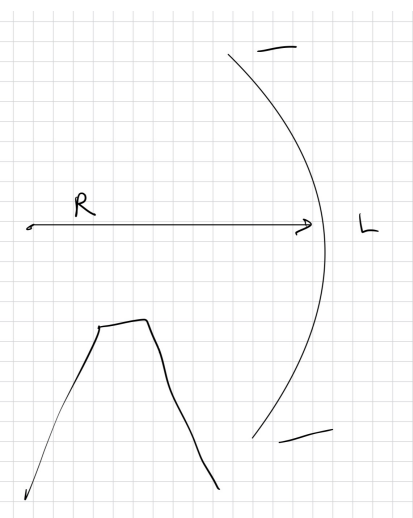
Date: 2/8/2024 [start]

Meeting Objective: Re-evaluate team roles & talk about approach to problem

Stacy: - Static Force Analysis

Brandon: Dynamic Force Analysis

Teagan: Assembly

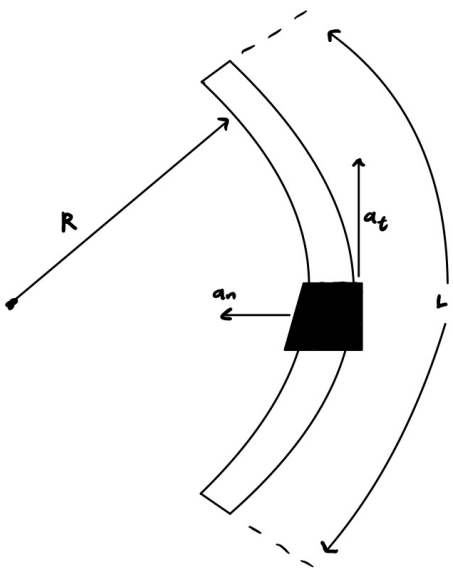


[End]

Date: 2/19/2024 start

Objective:

Establish what forces are important on track section

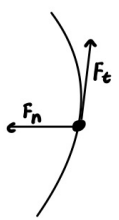


$$a_n = \frac{v^2}{r} = \left(\frac{dL}{dt}\right)^2 \frac{1}{r}$$

$$F_n = m_c a_n = \frac{m_c}{r}\left(\frac{dL}{dt}\right)^2$$

$$a_t = \frac{dv}{dt} = \frac{d^2L}{dt^2}$$

$$F_t = m_c a_t = m_c\left(\frac{d^2L}{dt^2}\right)$$



$$\sigma = \frac{My}{I}, \quad M = Fx$$

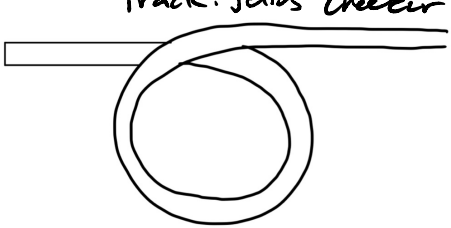
$$\tau = \frac{VQ}{It}, \quad V = F$$

End

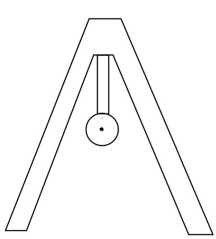
Date: 3/7/2024 start

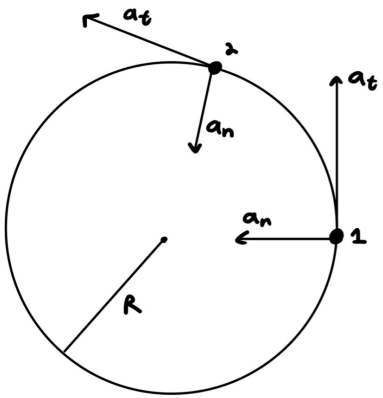
Objective: Establish Final track analysis and perform calculations

Track: Julius Cheever



A-Frame





$$a_t = \frac{L}{t^2}$$

L = Circumference of Wrap-Around

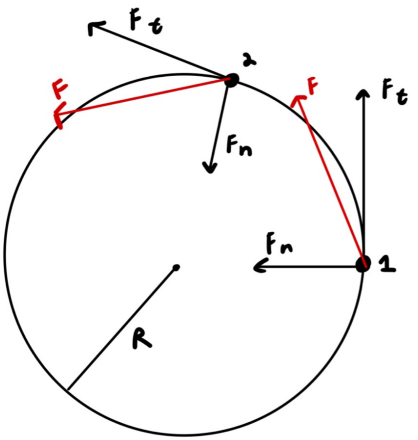
$$L = 2\pi R = 2\pi(20m) = 125.6m$$

given in spec sheet, $t = 10sec$

$$a_t = \frac{125.6m}{(10s)^2} = 1.26\ \frac{m}{s^2}$$

$$a_n = \left(\frac{L}{t}\right)^2 \frac{1}{R}$$

$$a_n = \left(\frac{125.6m}{10s}\right)^2 \left(\frac{1}{20m}\right) = 7.89\ \frac{m}{s^2}$$



Assumming:

Weight Vehicle: 1000 kg

Weight People Max capacity: 150 × 8 = 1200 kg

Total weight = 2200 kg

$$F_t = M a_t = (2200\ kg)\left(1.26\ \frac{m}{s^2}\right) = 2772\ N$$

$$F_N = M a_n = (2200\ kg)\left(7.89\ \frac{m}{s^2}\right) = 17558\ N$$

$$F = \sqrt{F_t^2 + F_N^2}$$

$$F = \sqrt{2772^2 + 17558^2}$$

$$F = 17577.9\ N$$

$$\sigma = \frac{Mc}{I}$$

Assumming:

Truck is 100 meters off ground

A-Frame Diameter = 1 meter

$$\sigma = \frac{(100\ m)(17577.9N)(0.5m)}{\frac{\pi}{4}(1m)^4} = 1119043.9\ Pa$$

$\tau = \frac{F}{A}$

$\tau = \frac{(17577.9\ N)}{\frac{\pi}{4}(1m)^2} = 22380\ Pa$

σ_{Fail} A36 Steel $= 550\ MPa$

τ_{Fail} A36 Steel $= 80\ GPa$

$\sigma < \sigma_{Fail}$ ✓

$\tau < \tau_{Fail}$ ✓

End