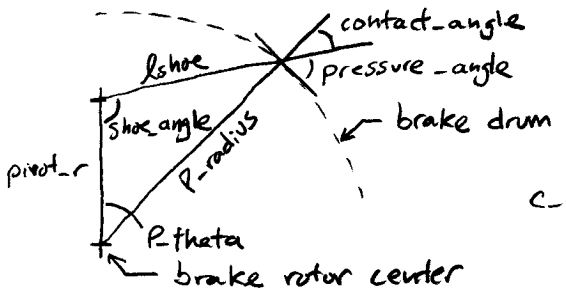
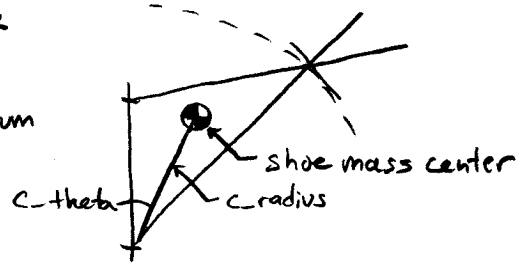
PREPARED BY	DATE	REPORT NO.
mjgradziel	30JUN2007	
CHECKED BY	DATE	PROJECT

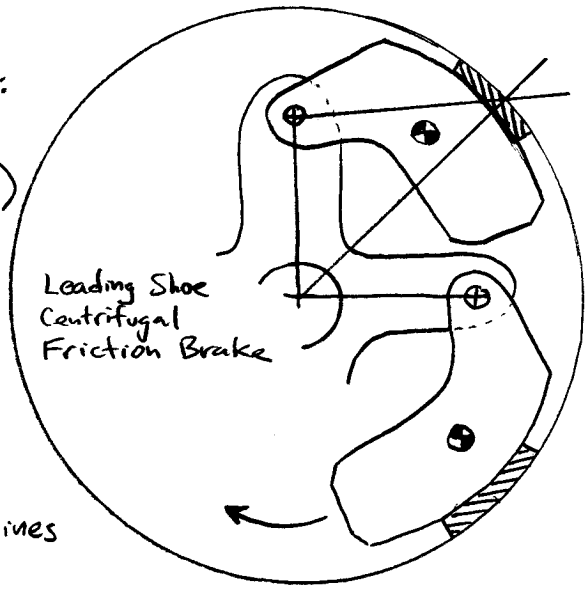
TITLE

Leading Shoe Centrifugal Friction Brake Drag Equations





For an idealized line contact at pad-to-drum



By design, these parameters are specified:

P_radius (brake drum radius)
pressure_angle (max bursting pressure @ $\frac{\pi}{2}$)

shoe_angle (amount of wedge action)
alternately, pivot_r may be specified

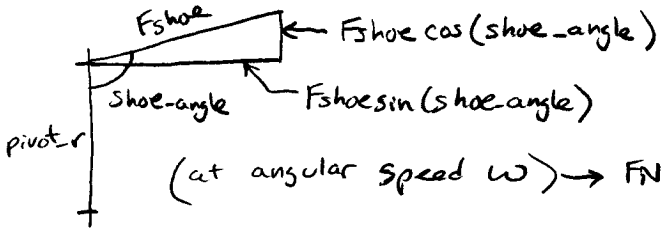
By calculation:

$$contact\_angle = \frac{\pi}{2} - pressure\_angle$$

$$pivot\_r = \frac{P\_radius \sin(contact\_angle)}{\sin(shoe\_angle)}$$ by law of sines

$$P\_theta = \pi - contact\_angle - shoe\_angle$$

$$lshoe = \sqrt{pivot\_r^2 + P\_radius^2 - 2\,pivot\_r\,P\_radius\cos(P\_theta)}$$ by law of cosines



Torque $T = Fshoe \sin(shoe\_angle) \cdot pivot\_r \cdot nshoes$

Brake Pad Normal Force FN

(at angular speed ω) $\rightarrow$ $$FN = \frac{m\omega^2 C\_radius \cdot \sin(C\_theta)}{\sin(P\_theta)} + Fshoe\cos(contact\_angle)$$

Tangential drag force $F_T = \mu F_N$ (per shoe) $= Fshoe \sin(contact\ angle)$

Isolate Fshoe: at steady state

$$Fshoe = \frac{\mu m\omega^2 C\_radius \cdot \sin(C\_theta)}{\sin(P\_theta)(\sin(contact\_angle) - \mu\cos(contact\_angle))}$$

$T = Fshoe \cdot \sin(shoe\_angle) \cdot pivot\_r \cdot nshoes$ drag coefficient $C\_brake = \frac{T}{\omega^2}$

$$C\_brake = \frac{\mu m \cdot C\_radius \cdot \sin(C\_theta)\sin(shoe\_angle)\, pivot\_r\, nshoes}{\sin(P\_theta)(\sin(contact\_angle) - \mu\cos(contact\_angle))}$$