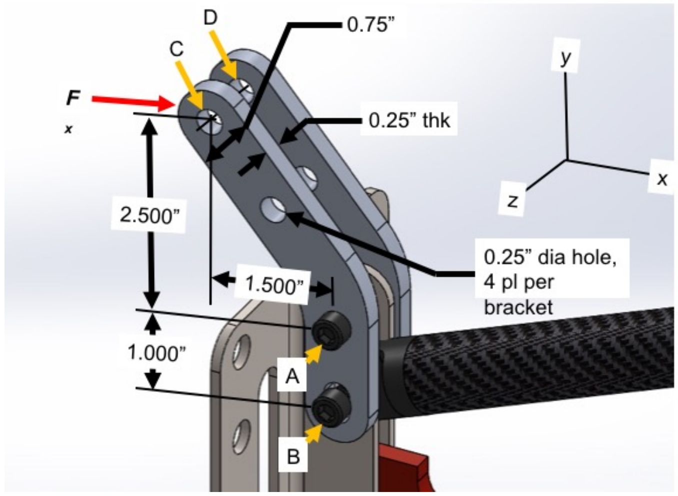
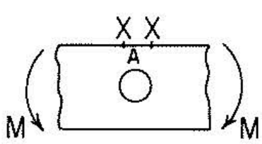


For the vehicle suspension components shown, a rod-end bearing transfers a horizontal force F_x to two brackets equally via a bolt that passes through the mounting holes at *C* and *D*. It is desired to determine the normal stress and factor of safety at hole *A* caused by the loading. If the loading has a static component F_{xs} = 600 lbs (caused by the weight of the vehicle) and an alternating component F_{xa} = ±100 lbs (caused by the suspension reacting to the road surface), determine the following:

- *35 pts:* The max normal stress σ_y found in the vicinity of the hole at *A*.
- *30 pts:* If the bracket is made of steel with an ultimate strength of S_{ut} = *60 ksi* and a corrected endurance limit of S_e = *16 ksi,* determine the factor of safety in fatigue near the hole *A* using the modified Goodman theory, ${}^{\sigma_a}/_{S_e} + {}^{\sigma_m}/_{S_{ut}} = {}^{1}/_{n}$.
- *15 pts:* Determine the bearing stress on hole *C* assuming zero clearance between the hole and bolt.
- *20 pts:* Determine the max principal stress in the bolt passing through holes *C* and *D* assuming a diameter of 0.25" and a zero pre-load.

Elastic stress, in-plane bending



The maximum stress at the edge of the hole is

$$\sigma_A = k\sigma_{\text{nom}}$$

where $\sigma_{\text{nom}} = \dfrac{12Mr}{t[D^3 - (2r)^3]}$ (at the edge of the hole)

$k = 2$ (independent of r/D)

The maximum stress at the edge of the plate is not directly above the hole but is found a short distance away on either side, points *X.*

$$\sigma_X = \sigma_{\text{nom}}$$

where $\sigma_{\text{nom}} = \dfrac{6MD}{t[D^3 - (2r)^3]}$ (at the edge of the plate)

Note that r = radius of hole, t = thickness of plate, D = width of plate