# Forces and Moments: Part 7

## Reduction to a wrench:

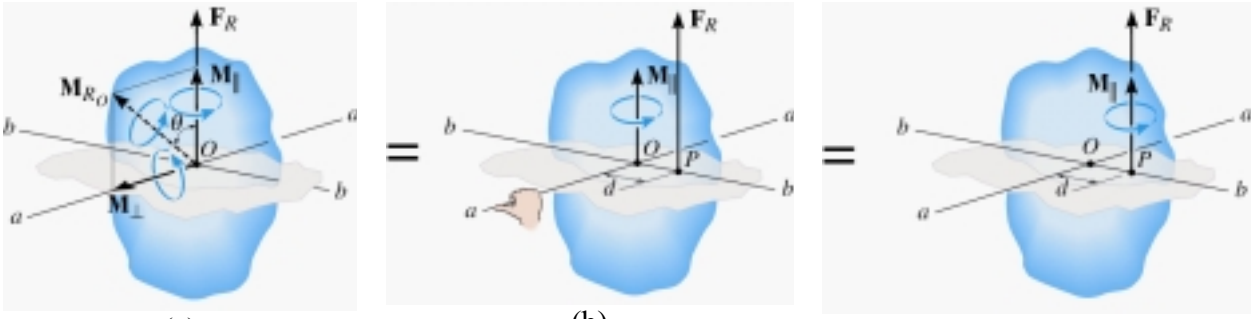
In the general case, the resultant moment ($M_{Ro}$) is perpendicular to $F_R$.

Now consider the case where $F_R$ acts at an angle θ to $M_{Ro}$ (Fig. a). Resolve $M_{Ro}$ into two components (Fig. a):

$M_{\parallel} \parallel F_R$ and $M_{\perp} \perp F_R$,

Eliminate $M_{\perp}$ by moving $F_R$ by distance $d = M_{\perp} / F_R$ from point O to point P. Now we are left with $F_R$ at P and $M_{\parallel}$ at O (Fig. b). Since $M_{\parallel}$ is a free vector which can be moved to P (Fig. c) This combination of a collinear force and a couple moment is called a wrench or screw.

The axis of the wrench has the same line of action as the force. The wrench tends to cause both translation along and rotation about this axis.




(a) (b) (c)