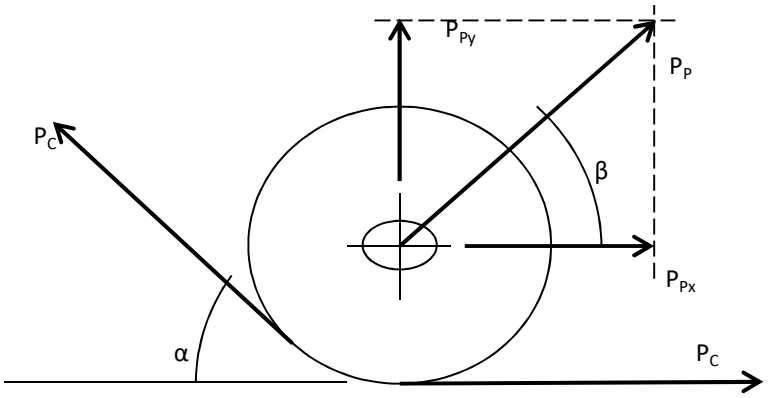
PULLEY AND CABLE LOADS

REFERENCES

[1] Advisory Circular AC 43-13 A/C Hardware Control Cables and Turnbuckles
[2] Military Standard MS20220
[3] Military Standard MS24566

PULLEY LOAD AS A FUNCTION OF WRAP ANGLE - DERIVATION OF THE EQUATION

P_C = Tension in the Cable
P_P = Load on the Pulley

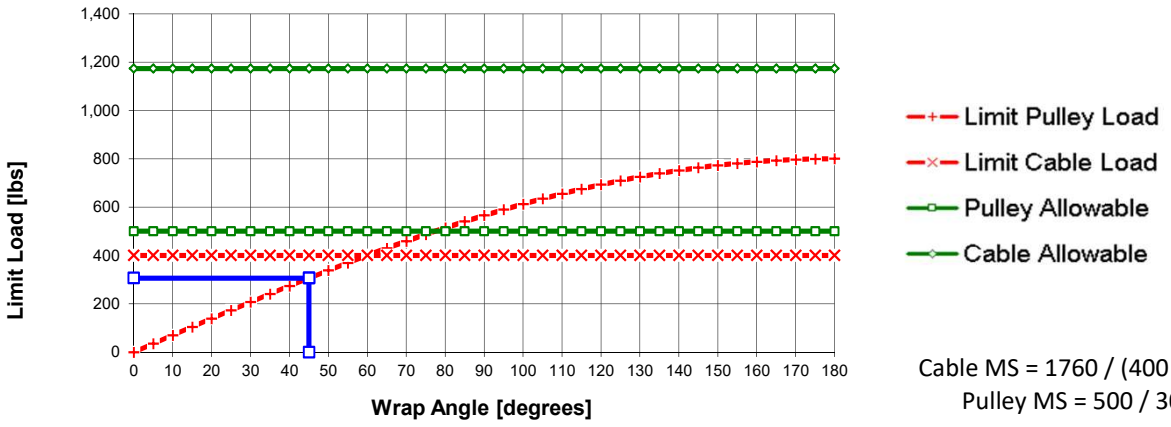


$P_{Px} = P_C - P_C \cos\alpha$
$= 400 - 400 \times \cos[\text{RADIANS}[45]]$
$= 117.2$ lb
$P_{Py} = P_C \sin\alpha$
$= 400 \times \sin[\text{RADIANS}[45]]$
$= 282.8$ lb
$P_P = \sqrt{(P_{Px}^2 + P_{Py}^2)}$
$= \sqrt{((Pc - Pc\cos\alpha)^2 + Pc^2\sin^2\alpha)}$
$= \sqrt{(P_c^2 - 2P_c^2\cos\alpha + P_c^2\cos^2\alpha + P_c^2\sin^2\alpha)}$
$= P_c\sqrt{(1 - 2\cos\alpha + 1)}$
$= 2P_c\sqrt{(0.5*(1-\cos\alpha))}$
$= 2P_c\sin(\alpha/2)$

PULLEY LOAD AS A FUNCTION OF WRAP ANGLE

PULLEY:	MS20220-1		Pulley Part and Dash No.
P_1 =	500	lbs	Allowable Limit Load on Pulley
CABLE:	0.125 in Dia. Cable, MIL-W-83420 COMP B (CRES)		
P_u =	1,760	lbs	Cable Minimum Breaking Strength (Ultimate)
P_2 =	1,173	lbs	Cable Limit Strength
P =	400	lbs	Limit Tension in the Cable
α =	45	deg	Wrap Angle (0^o - 180^o)
β =	22.5	deg	

$= 2 \times 400 \times \text{SIN}[\text{RADIANS}[45 / 2]]$
P_P = 306.1 lbs Limit Load on the Pulley



Cable MS = 1760 / (400 · 1.5) - 1 = **1.93**
Pulley MS = 500 / 306.15 - 1 = **0.63**