$E := 120 \cdot in$ $I := 256.5 \cdot in$ YD pg 182   Figures from sail plan

$P := 304 \cdot in$ $J := 91 \cdot in$ $a_1 := 295 \cdot in$ $a_2 := 120in$

$d_2 := 52 \cdot in$

$d_1 := 78.4 \cdot in$

$b := 39.25 \cdot in$

$BD := 34.6in$

$L_1 := 138.6 \cdot in$

$\beta_1 := 15.3 \cdot deg$ $\beta_2 := 15.0deg$ $\gamma_1 := 2.3deg$

$L_2 := 130in$

$A_M := \frac{(E \cdot P)}{2}$ $A_M = 126.667\ ft^2$ Area of the main

$A_F := \frac{(J \cdot I)}{2}$ $A_F = 81.047\ ft^2$ Area of the jib

$L := 82 \cdot in$

Vang Dimensions

$a := \frac{L}{\frac{A_M}{A_F} + 1}$ $a = 31.995\ in$ YD pg 161

$DV_1 := 33 \cdot in$

$DV_2 := 24 \cdot in$

$HA := 140 \cdot in$

$Lead := \frac{17}{224}$

$Lead = 7.589\ \%$ YD Page 162 Lead should be 5-9% for masthead sloops

$Displacement := 1309 \cdot lbf$ From Calculation

$GZ_{30} := 27.5 \cdot in$ Distance to heeled center of stability pg 41 YD

$RM_{30} := Displacement \cdot GZ_{30}$

$RM_{30} = 2999.8\ lbf \cdot ft$

$n := 3$ Max number of persons

$L_{hiking} := 40 \cdot in$

$W_{passenger} := 175 \cdot lbf$

$RM_{Passengers} := n \cdot L_{hiking} \cdot W_{passenger}$

$RM_{Passengers} = 1750\ lbf \cdot ft$

$RM_{total} := RM_{30} + RM_{Passengers}$

$RM_{total} = 4.75 \times 10^3\ lbf \cdot ft$ Total righting moment

Transverse Load Calculations:

$T_1 := \frac{RM_{total}}{a_1}$ $T_1 = 193.212\ lbf$

$T_2 := \frac{RM_{total}}{a_2}$ $T_2 = 474.979\ lbf$

$T_{head} := .4 \cdot T_2$ $T_{head} = 190\ lbf$

$T_{boom} := .33 \cdot T_2$ $T_{boom} = 157\ lbf$

$T_{hu} := T_{head} \cdot \frac{d_1}{(d_1 + d_2)}$ $T_{hu} = 114\ lbf$

$T_{hl} := T_{head} \cdot \left[\frac{d_2}{(d_1 + d_2)}\right]$ $T_{hl} = 76\ lbf$

$T_{bu} := T_{boom} \cdot \frac{BD}{L_1}$

$T_{bu} = 39.129\ lbf$

$I_x := 16.8 \times 10^4 \cdot mm^4$

$I_x = 16.8\ cm^4$

$I_x = 0.404\ in^4$

Dimensioning Forces:

Load Case 1	Load Case 2
$F_{1.1} := 0$	$F_{2.1} := T_{hl} + T_{bu}$
$F_{1.2} := T_1$	$F_{2.2} := T_{hu}$
$F_{1.3} := 0$	$F_{2.3} := 0$
$F_{1.1} = 0$	$F_{2.1} = 115\ lbf$
$F_{1.2} = 193\ lbf$	$F_{2.2} = 114\ lbf$
$F_{1.3} = 0$	$F_{2.3} = 0$

Max Dimensioning Loads:

$F_1 := F_{2.1}$

$F_2 := F_{1.2}$

$F_3 := 0$

Shroud Loads Pg 188 YD

$$D_2 := \frac{F_2}{\sin(\beta_2)} \qquad D_2 = 747\ \text{lbf}$$

$$V_1 := \frac{F_2}{(\cos(\gamma_1)\cdot\tan(\beta_2))} \qquad V_1 = 721.658\ \text{lbf}$$

$$C_1 := F_2 - V_1\cdot\sin(\gamma_1)$$

$$D_1 := \frac{(F_1 + C_1)}{\sin(\beta_1)} \qquad D_1 = 1058\ \text{lbf}$$

Dimensioning Loads

$$P_{D1} := 2.8\cdot D_1 \qquad P_{D1} = 2962\ \text{lbf}$$

$$P_{D2} := 3.0\cdot D_2 \qquad P_{D2} = 2240\ \text{lbf}$$

$$P_{V1} := 3.0\cdot V_1 \qquad P_{V1} = 2165\ \text{lbf}$$

Transverse Moment of Inertia Required of the Mast

$b = 0.997\ m$ Width to shrouds

$RM_{total} = 6440\ newton \cdot m$ Righting Moment

$L_1 = 3.52\ m$ Panel 1 Height

$L_2 = 3.302\ m$ Panel 2 Height

$k_3 := 1.35\ \frac{m^2}{newton}$ Deck stepped masts

$k_1 := 2.5 \cdot k_3$ Panel factor - pg 194 YD

$m := 1$ Aluminum mast

$k_1 = 3.375\ m^2\ \frac{m^2}{newton}$

$RM_{total} = 4.75 \times 10^3\ ft \cdot lbf$

$PT := 1.5 \cdot \frac{RM_{total}}{b}$

$PT = 9689\ newton$

$I_x := \frac{k_1}{1000^2} \cdot m \cdot PT \cdot \frac{L_1^{\ 2}}{1000^2}$om pg 194 YD

$I_x = 4.053 \times 10^5\ mm^4$ $I_x = 0.974\ in^4$

Longitudinal Moment of Inertia Required of the Mast

$k_4 := 1.35\ \frac{m^2}{newton}$ Deck stepped masts

$k_2 := 1.0 \cdot$ Staying Factor - pg 196 YD

$h := L_1 + L_2$ $h = 6.822\ m$

$PT := 1.5 \cdot \frac{RM_{total}}{b}$ $m := 1$ Aluminum mast

$PT = 9689\ newton$

$I_y := \frac{k_3}{1000^2} \cdot m \cdot PT \cdot \frac{h^2}{1000^2}$ From pg 194 YD

$I_y = 6.088 \times 10^5\ mm^4$ These units make sense but I don't have a lot of confidence in them!

$I_y = 1.463\ in^4$

$E := 120 \cdot in$

$DV_1 := 33 \cdot in$ $DV_2 := 24 \cdot in$

$HA := 140 \cdot in$

$\sigma_{0.2} := 185 \cdot \frac{newton}{mm^2}$

Boom Loading:

$$F_v := .5 \cdot RM_{total} \cdot \frac{E}{(HA \cdot DV_1)}$$

$F_v = 740\ lbf$

$$F_h := .5 \cdot RM_{total} \cdot \frac{E}{(HA \cdot DV_2)}$$

$F_h = 1.018 \times 10^3\ lbf$

$$SM_v := \frac{600}{1000} \cdot RM_{total} \cdot \frac{(E - DV_1)}{(\sigma_{0.2} \cdot HA)}$$

$SM_v = 1.298 \times 10^4\ mm^3$

$SM_v = 0.792\ in^3$ Required Vertical Section Modulus

$$SM_h := \frac{SM_v}{2}$$

$SM_h = 0.396\ in^3$ Required Horizontal Section Modulus