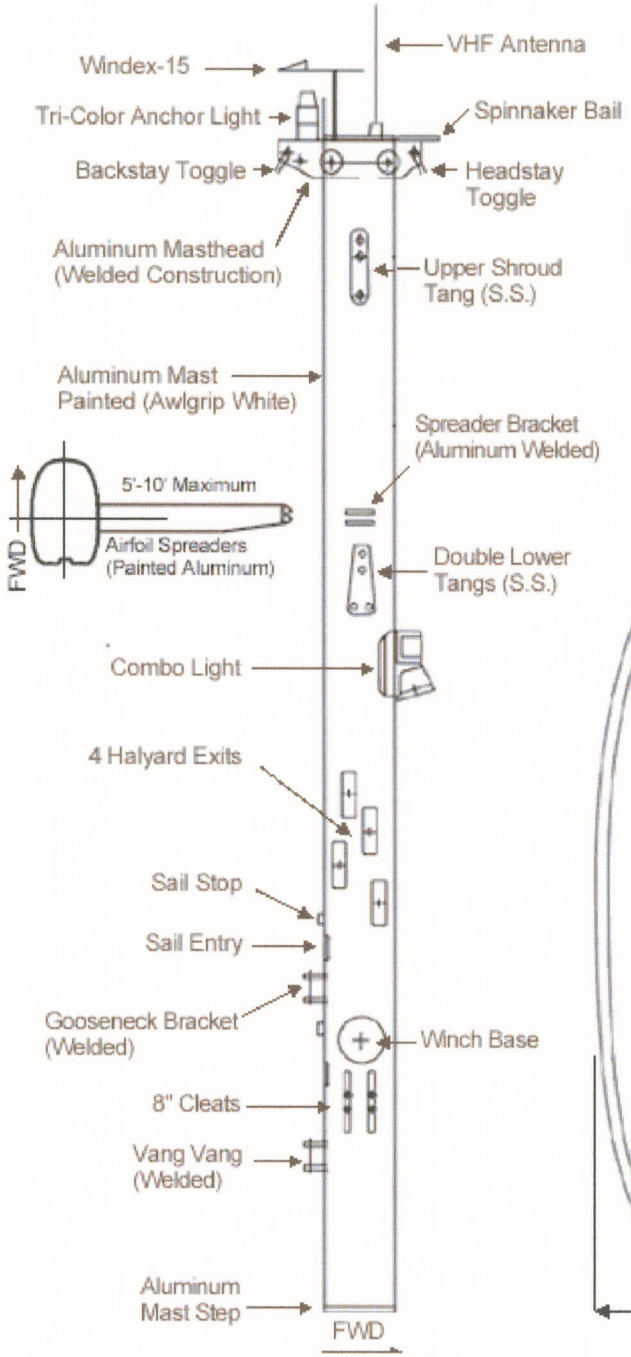
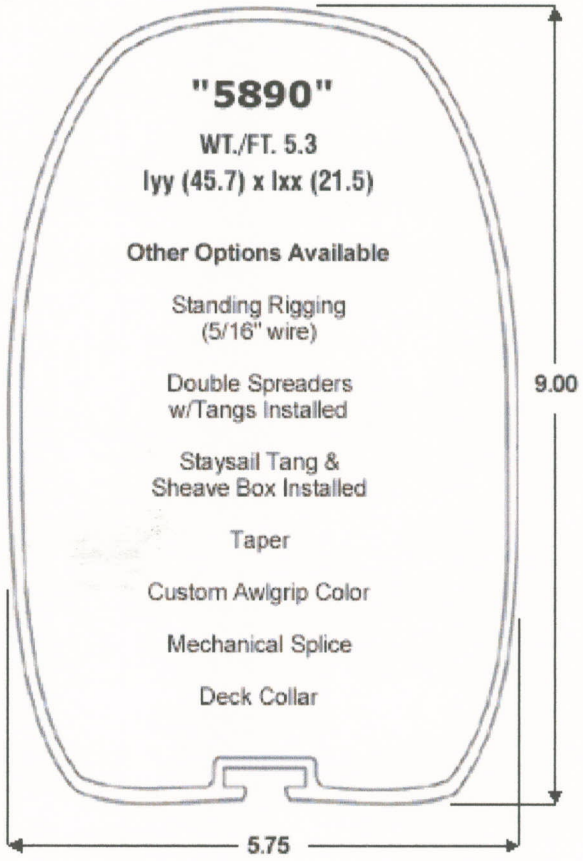


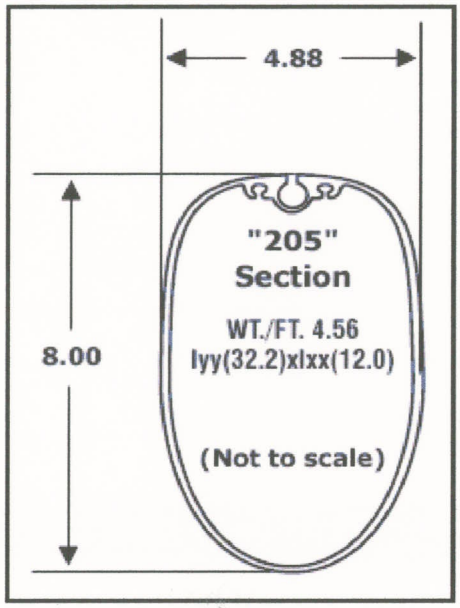
Typical Configuration "5890" Section Mast Boats 40' to 45'

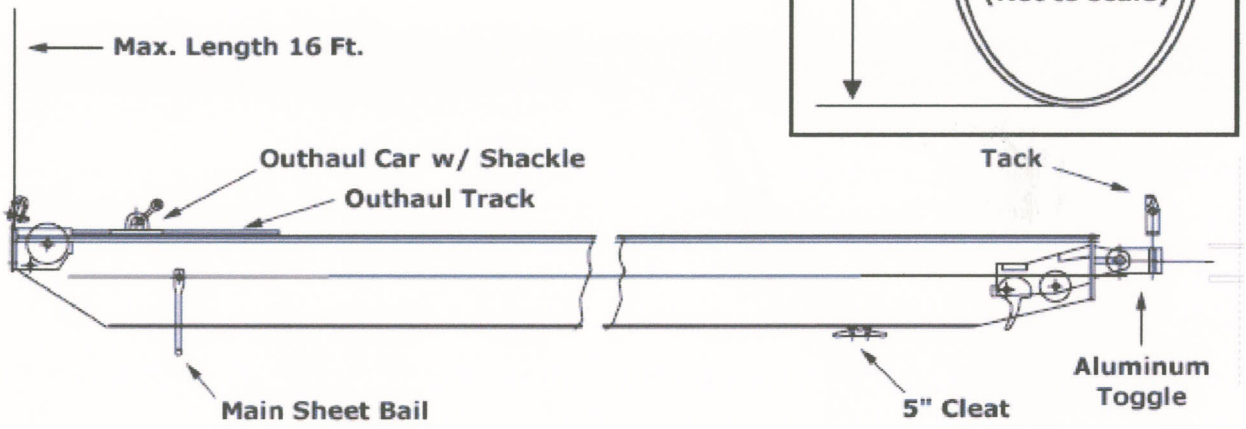
(Mast Length 62' Max)



"205 Section" Boom

Max. Length 16 Ft.





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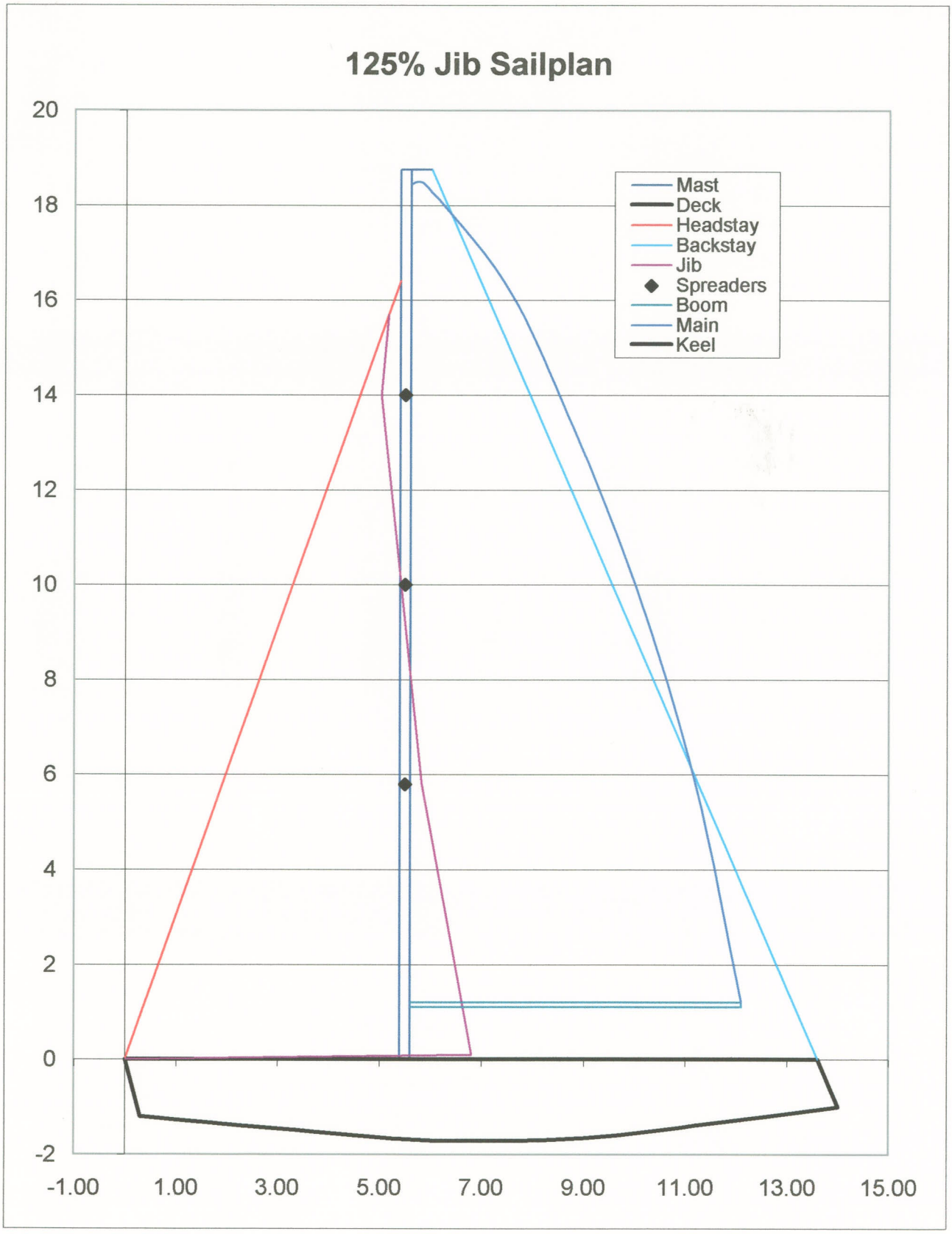

125% Jib Sailplan
20
18
16
14
12
10
8
6
4
2
0
-2
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
15.00
Mast
Deck
Headstay
Backstay
Jib
Spreaders
Boom
Main
Keel

Rig Design - 125% Jib

Main Dimensions

Mast height above the deck, I [m] =	18.75		
Mast distance from stem, J [m] =	5.50		
Mast transverse dimension, MT [m] =	0.10		
Mast Longitudinal Dimension, ML [m] =	0.20		
Boom height above the deck BH [m] =	1.20		
Boom length, E [m] =	6.50		
Mainsail luff P [m] =	17.55	Main AR =	2.7
Jib halyard height above deck IM [m] =	16.41		
Jib luff JL [m] =	15.59	Jib AR =	2.267045
Jib foot JF [m] =	6.88		
Height of lower spreader, HSL [m] =	5.80		
height of middle spreader, HSM [m] =	10.00		
Height of upper spreader, HSU [m] =	14.00		
Freeboard at mast station, FR [m] =	1.25		

Sail area:

Mainsail SA_M [m^2] =	62.74
Jib area SA_J [m^2] =	53.58
Upwind sailarea SA_U =	116.32

Mainsail CE height above deck [m] =	7.76
Jib CE height above deck [m] =	6.23
Upwind CE height above deck [m] =	7.06

Balance Procedure

Heeling arm [m] = 9.457

Heeling moment HM:

Wind velocity [m/s] =	10.3
Air density [Kg/m^3] =	1.225
Average C_L =	1
HM [Nm] =	71476.59697
HM [KGm] =	7286.095512

Righting moment at 25 degrees of heel:

RM [kgm] =	7292.098 from Hydromax
Error =	-0.08%

Headstay angle from vertical, HA [deg] =	18.22
Backstay angle from vertical, BA [deg] =	24.13

The chainplate width is calculated imposingthat the angle between the jib foot and the centerline is 12 degrees.

Chainplate width, b [m] = 1.144

Consider a true wind speed of 15 knots at 10 m above the water; the actual wind speed at a different height can be calculated using:

$$U(z) = U\_star / k * Ln (z / z_0)$$

z_0 [m] =	0.004
k =	0.4
U_{10} [kt] =	15
U_{10} [m/s] =	7.725
U_{STAR} [m/s] =	0.909
So	
U(HSL) [m/s] =	7.380
U(HSM) [m/s] =	7.841
U(HSU) [m/s] =	8.142

Now it is necessary to calculate the wind triangles to find the apparent wind speed and apparent wind angle at both heights:

Boat Speed, VB [kt] =	7
Boat Speed, VB [m/s] =	3.605
True wind angle, TWA [deg] =	42

At the lower spreader:

Apparent Wind Speed, AWS [m/s] =	10.344
Apparent Wind Angle, AWA [deg] =	28.51

but this needs to be corrected for downwash, leeway and ideal angle of attack

Downwash, [deg] =	4
Leeway, [deg] =	2
Ideal AOA, [deg] =	1
Corrected AWA, [deg] =	21.51 at the lower spreader

At the middle spreader:

Apparent Wind Speed, AWS [m/s] =	10.793
Apparent Wind Angle, AWA [deg] =	29.09

but this needs to be corrected for downwash, leeway and ideal angle of attack

Downwash, [deg] =	3
Leeway, [deg] =	2
Ideal AOA, [deg] =	1
Corrected AWA, [deg] =	23.43 at the lower spreader

At the upper spreader:

Apparent Wind Speed, AWS [m/s] =	11.086
Apparent Wind Angle, AWA [deg] =	29.43

but this needs to be corrected for downwash, leeway and ideal angle of attack

Downwash, [deg] =	2
Leeway, [deg] =	2
Ideal AOA, [deg] =	1
Corrected AWA, [deg] =	24.43 at the lower spreader

These angle allow us to calculate the ideal position of the jib leech at the mast

At lower spreader	
Foretriangle dimension, [m] =	3.556
Jib Chord, [m] =	4.317
Jib distance from CL at mast, [m] =	1.402
Jib distance from CL at leech, [m] =	1.583
Long. Position of jib leech, [m] =	4.016
Average, [m] =	1.492
At middle spreader	
Foretriangle dimension, [m] =	2.148
Jib Chord, [m] =	2.464
Jib distance from CL at mast, [m] =	0.931
Jib distance from CL at leech, [m] =	0.980
Long. Position of jib leech, [m] =	2.292
Average, [m] =	0.955
At upper spreader	
Foretriangle dimension, [m] =	0.807
Jib Chord, [m] =	0.700
Jib distance from CL at mast, [m] =	0.366
Jib distance from CL at leech, [m] =	0.289
Long. Position of jib leech, [m] =	0.651
Average, [m] =	0.328

Final Geometry

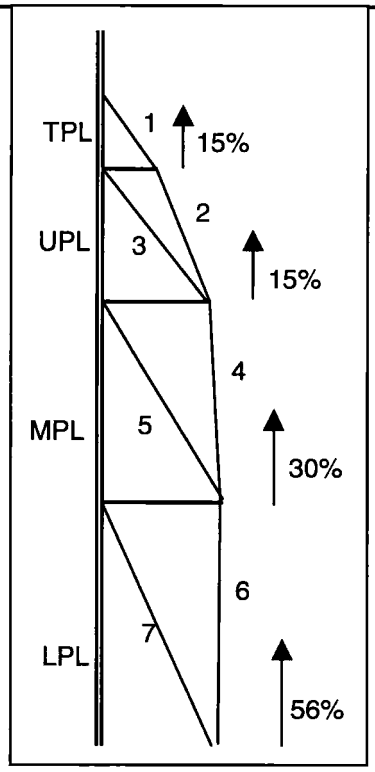
Chainplate width, b [m] =	1.144	b
Lower spreader length, [m] =	1.280	LSL
Middle spreader length [m] =	0.955	LSM
Upper spreader length, [m] =	0.550	LSU
Lower panel length, [m] =	5.300	LPL
Mid panel length, [m] =	4.200	MPL
Upper panel length, [m] =	4.000	UPL
Top panel length, [m] =	2.406	TPL

Angles from vertical [deg]:

Shroud # 1 =	12.88
Shroud # 2 =	5.79
Shroud # 3 =	13.43
Shroud # 4 =	4.42
Shroud # 5 =	16.95
Shroud # 6 =	-1.48
Shroud # 7 =	12.18

Spreader Up-Angle from horizontal [deg]:

Upper =	9.33
Middle =	7.01
Lower =	4.60



Structural Calculations

Righting Moment at 30 deg of heel, RM [Kg-m] = 7910.76 from Hydromax
RM [lb-ft] = 57218.52708
Chainplate tension, PT [lb] = 22877.395
Mast Compression, PC [lb] = 42323.181

Moments of Inertia [in^4] = C * P * L *10^{-8}

C_L =	0.52		
C_T Upper =	1.69		
C_T Lower =	1.13	with split lower shrouds	
L_L, [in] =	626.2	L_L, [in] =	417.5681
L_T Upper, [in] =	165.4		
L_T Lower, [in] =	208.7		
I_L =	86.31	38.37	with split lower shrouds
I_T Upper =	19.56		
I_T Lower =	20.82		

Tension in the shrouds using the scheme in Henry and Miller paper.

Shr. # 1, [lb] =	3520.1	in [Kg] =	1596.7		
Shr. # 2, [lb] =	3449.2	in [Kg] =	1564.5	Sum of shrouds 2 and 3 is =	3164.907
Shr. # 3, [lb] =	3528.1	in [Kg] =	1600.4	and is bigger than Shr 4, so I can join them.	
Shr. # 4, [lb] =	6883.7	in [Kg] =	3122.4		
Shr. # 5, [lb] =	6218.2	in [Kg] =	2820.6	Sum of shrouds 4 and 5 is =	5943.0
Shr. # 6, [lb] =	12815.6	in [Kg] =	5813.2	and is bigger than Shr 6, so I can use 4	
Shr. # 7, [lb] =	10297.7	in [Kg] =	4671.0	and 5 down to the deck.	
Shr. # 7, [lb] =	5228.3	in [Kg] =	2371.5	using split lower shrouds with a 10 deg angle front-aft	

Compression in the spreaders:
Upper [Kg] = 198.1
Middle [Kg] = 636.8
Lower [Kg] = 913.3

Weight Estimates

Using the split lower shrouds I can use the section "5890" from Hall Spar, otherwise I need section "255".
These sections have the following characteristics:

Section	Chord [in]	Width [in]	C/W	I_L [in^4]	I_T [in^4]	Weigth [lb/ft]
5890	9.000	5.750	1.565	45.700	21.500	5.300
240	9.910	6.200	1.598	68.440	27.230	6.250
255	10.000	5.375	1.860	98.470	26.450	9.130
205 Boom	8.000	4.880	1.639	32.200	12.000	4.560
061 Spreader	2.250	0.609	3.695	0.130	0.010	0.380
081 Spreader	3.250	0.880	3.693	0.540	0.060	0.790

Rigging Type	Size [in]	Break Str.[lb]	Weight [lb/100 ft]
1 x 19 302 SS	3/16	4700.000	7.200
1 x 19 302 SS	1/4	8200.000	12.560
1 x 19 Dryform	5/16"	13530.000	22.940
1 x 19 Dryform	1/4"	8844.000	15.000
1 x 19 Dryform	6 mm	7810.000	13.250
1 x 19 Dryform	5 mm	5368.000	9.100

Mast length for keel, ML [m] =	20.400	in [ft] =	66.93	Use section 240
Boom length, BL [m] =	6.800	in [ft] =	22.31	Use section 205 boom
Top spreader length, LSU [m] =	0.550	in [ft] =	1.80	Use section 061 spreader
Mid spreader length, LSM [m] =	0.955	in [ft] =	3.13	Use section 081 spreader
Low spreader length, LSL [m] =	1.280	in [ft] =	4.20	Use section 081 spreader
Length Shr. 1 + 2 + 3, [m] =	10.601293	in [ft] =	34.78	Use 1 x 19 Dryform 1/4"
Length Shr. 4 + 5 + 6 + 7, [m] =	30.050677	in [ft] =	98.59	Use 1 x 19 Dryform 3/8"
Headstay length, [m] =	17.303613	in [ft] =	56.77	Use 1 x 19 Dryform 3/8"
Backstay length, [m] =	21.133504	in [ft] =	69.33	Use 1 x 19 Dryform 3/8"

Item	**Weight [Kg]**	**VCG [m]**	**LCG [m]**
Mast, unfitted	160.90	9.800	5.500
Boom, unfitted	46.15	2.450	9.000
Headstay	5.91	9.453	2.750
Backstay	7.21	10.625	9.750
Shrouds 1, 2, 3	2.37	14.453	5.500
Shrouds 4, 5, 6,	10.26	8.250	5.500
Top spreader	0.31	15.250	5.500
Mid spreader	1.12	11.250	5.500
Lower spreader	1.50	7.050	5.500
Total =	235.73	8.354	6.246

Structural Calculations

ABS Definitions		Min. Required
Length, L [m]	13.4	
Breadth, B [m]	4	
Depth, D [m]	1.5	
Draft, d [m]	0.47	0.5708
Keel Root center, Ct [m]	0.6	
Keel span, s [m]	2.4	
Keel root chord, Ch [m]	1.2	

Single Skin Laminate
The minimum thickness must greater than values given by either:

1) t_a [mm] = s * c * sqrt(p * k / Sigma)

2) t_b [mm] = 0.75 * s * c * (p * k1 / (0.02 * E)) ^ (1 / 3)

Laminate Properties	
E-glass fiber density, [Kg/m^3]	2600
Polyester resin density, [Kg/m^3]	1200
Fiber weight fraction	0.35
Laminate density, [Kg/m^3]	1478.673
Flexural strength, F_S [N/mm^2]	172
Flexural modulus, E_F [N/mm^2]	7580
Tensile strength, T_S [N/mm^2]	124
Tensile modulus, E_T [N/mm^2]	6890
Compressive strength, C_S [N/mm^2]	117
Compressive modulus, E_C [N/mm^2]	6890

Basic Head, [m] = 5.2084
Sigma [N/mm^2] = E_F/2 = 86

Single laminate skin construction

	Shell below 25.1 cm above DWL									
	Bow	5% of LWL aft of FP		40% of LWL aft of FP						Stern
x [m] =	6.708	5.760	1.800	1.280	-0.600	-2.560	-3.840	-5.120	-6.400	-7.292
h [m] =	4.167	6.250	6.250	6.250	5.679	5.083	4.695	4.306	3.917	3.646
s [mm] =	360	400	700	770	900	900	870	830	770	730
A [mm] =	0	30	100	70	10	10	10	8	5	5
CF =	0.082	0.114	0.347	0.401	0.503	0.503	0.479	0.448	0.401	0.370
F =	0.901	0.856	0.597	0.559	0.488	0.488	0.505	0.526	0.559	0.600
p [N/mm2] =	0.0375	0.0535	0.0373	0.0349	0.0277	0.0248	0.0237	0.0227	0.0219	0.0219
k =	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
k1 =	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
1) t [mm] =	5.319	6.527	8.838	9.976	11.299	10.690	10.092	9.435	8.631	8.174
2) t [mm] =	5.149	5.956	8.564	9.774	11.505	11.088	10.549	9.935	9.141	8.659

	Shell above 25.1 cm above DWL									
	Bow	5% of LWL aft of FP		40% of LWL aft of FP						Stern
x [m] =	6.708	5.760	1.800	1.280	-0.600	-2.560	-3.840	-5.120	-6.400	-7.292
h [m] =	3.24632	5.008608	5.008608	5.008608	5.008608	5.008608	5.008608	5.008608	5.008608	2.921688
s [mm] =	500	500	580	700	730	710	690	650	580	540
A [mm] =	0	0	0	0				8	16	20
CF =	0.191	0.191	0.254	0.347	0.370	0.355	0.339	0.308	0.254	0.223
F =	0.779	0.779	0.716	0.623	0.600	0.615	0.631	0.662	0.716	0.747
p [N/mm2] =	0.0253	0.0390	0.0359	0.0312	0.0300	0.0308	0.0316	0.0332	0.0359	0.0218
k =	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
k1 =	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
1) t [mm] =	6.065	7.533	8.377	9.428	9.646	9.503	9.351	8.913	8.146	5.859
2) t [mm] =	6.270	7.245	8.171	9.413	9.692	9.507	9.317	8.809	7.945	6.208

	Deck			Cockpit	Reinforced Shell @ Keel		
	Forward End	Mid	Aft End	Everywhere	Forward End	Mid	Aft End
x [m] =		0.9	-3.2		1.8	1.28	-0.6
h [m] =	2.366	2.366	2.366	2.366	11.250	11.250	10.222
s [mm] =	530	840	490	1000	700	770	900
A [mm] =	100	265	0	0	100	70	10
CF =	0.215	0.456	0.184	0.580	0.347	0.401	0.503
F =	0.755	0.525	0.788	0.434	0.597	0.569	0.488
p [N/mm2] =	0.0179	0.0124	0.0186	0.0103	0.0672	0.0640	0.0499
k =	0.5	0.5	0.5	0.5	0.5	0.5	0.5
k1 =	0.028	0.028	0.028	0.028	0.028	0.028	0.028
1) t [mm] =	4.383	4.998	5.102	7.724	11.857	13.502	15.159
2) t [mm] =	4.802	5.817	5.550	9.281	10.418	11.959	13.995

Sandwich Construction

Outer skin required section modulus: $SM_O = t_a^2 * F / (600 * T_S)$

Inner skin required section modulus: $SM_I = t_a^2 * F / (600 * T_C)$

Required moment of inertia: $I = t_b^3 * E_F / (2580 * (E_C + E_T))$

Core Material Properties

Density [Kg/m^3] =	85
Shear strength [N/mm^2] =	1.2
v =	0.5
Head factor HF =	0.4
τ [N/mm^2] =	0.6

<= always equal to 0.4 for spacing smaller than 1045 mm.

Lower Panel 1 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.200	1.000	0.200	0.100	0.001	0.020	0.002
Core	0.700	1.000		0.550			
Inner Skin	0.200	1.000	0.200	1.000	0.001	0.200	0.200
Total =	1.100		0.400		0.001	0.220	0.202

d_{NA} [cm] =	0.550	
SM_O [cm^3] =	0.1497	0.0337
SM_I [cm^3] =	0.1497	0.0357
I [cm^4] =	0.0823	0.0354
Thickness [mm]	9.000	5.000
Sand. weight, [Kg/m^2] =	6.510	

Lower Panel 2 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.200	1.000	0.200	0.100	0.001	0.020	0.002
Core	0.800	1.000		0.600			
Inner Skin	0.200	1.000	0.200	1.100	0.001	0.220	0.242
Total =	1.200		0.400		0.001	0.240	0.244

d_{NA} [cm] =	0.600	
SM_O [cm^3] =	0.1689	0.0504
SM_I [cm^3] =	0.1689	0.0534
I [cm^4] =	0.1013	0.0645
Thickness [mm]	10.000	8.333
Sand. weight, [Kg/m^2] =	6.595	

Lower Panel 3 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.300	1.000	0.300	0.150	0.002	0.045	0.007
Core	1.200	1.000		0.900			
Inner Skin	0.250	1.000	0.250	1.625	0.001	0.406	0.660
Total =	1.750		0.550		0.004	0.451	0.667

d_{NA} [cm] =	0.820	
SM_O [cm^3] =	0.3659	0.0916
SM_I [cm^3] =	0.3230	0.0970
I [cm^4] =	0.3002	0.1583
Thickness [mm]	14.750	14.584
Sand. weight, [Kg/m^2] =	9.153	

Lower Panel 4 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.350	1.000	0.350	0.175	0.004	0.061	0.011
Core	1.400	1.000		1.050			
Inner Skin	0.250	1.000	0.250	1.875	0.001	0.469	0.879
Total =	2.000		0.600		0.005	0.530	0.890

d_{NA} [cm] =	0.883	
SM_O [cm^3] =	0.4826	0.1156
SM_I [cm^3] =	0.3818	0.1225
I [cm^4] =	0.4263	0.2245
Thickness [mm]	17.000	16.042
Sand. weight, [Kg/m^2] =	10.062	

Lower Panel 5 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.350	1.000	0.350	0.175	0.004	0.061	0.011
Core	1.500	1.000		1.100			
Inner Skin	0.250	1.000	0.250	1.975	0.001	0.494	0.975
Total =	2.100		0.600		0.005	0.555	0.986

d_{NA} [cm] =	0.925	
SM_O [cm^3] =	0.5161	0.1555
SM_I [cm^3] =	0.4063	0.1648
I [cm^4] =	0.4774	0.3505
Thickness [mm]	18.000	17.037
Sand. weight, [Kg/m^2] =	10.147	

Lower Panel 6 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.300	1.000	0.300	0.150	0.002	0.045	0.007
Core	1.400	1.000		1.000			
Inner Skin	0.200	1.000	0.200	1.800	0.001	0.360	0.648
Total =	1.900		0.500		0.003	0.405	0.655

d_{NA} [cm] =	0.810	
SM_O [cm^3] =	0.4069	0.1424
SM_I [cm^3] =	0.3024	0.1509
I [cm^4] =	0.3296	0.3071
Thickness [mm]	16.500	15.250
Sand. weight, [Kg/m^2] =	8.583	

Lower Panel 7 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.300	1.000	0.300	0.150	0.002	0.045	0.007
Core	1.200	1.000		0.900			
Inner Skin	0.250	1.000	0.250	1.625	0.001	0.406	0.660
Total =	1.750		0.550		0.004	0.451	0.667

d_{NA} [cm] =	0.820	
SM_O [cm^3] =	0.3659	0.1299
SM_I [cm^3] =	0.3230	0.1376
I [cm^4] =	0.3002	0.2674
Thickness [mm]	14.750	13.614
Sand. weight, [Kg/m^2] =	9.153	

Lower Panel 8 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.300	1.000	0.300	0.150	0.002	0.045	0.007
Core	1.200	1.000		0.900			
Inner Skin	0.200	1.000	0.200	1.600	0.001	0.320	0.512
Total =	1.700		0.500		0.003	0.365	0.519

d_{NA} [cm] =	0.730	
SM_O [cm^3] =	0.3496	0.1156
SM_I [cm^3] =	0.2631	0.1225
I [cm^4] =	0.2552	0.2245
Thickness [mm]	14.500	11.913
Sand. weight, [Kg/m^2] =	8.413	

Lower Panel 9 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.250	1.000	0.250	0.125	0.001	0.031	0.004
Core	1.100	1.000		0.800			
Inner Skin	0.200	1.000	0.200	1.450	0.001	0.290	0.421
Total =	1.550		0.450		0.002	0.321	0.424

d_{NA} [cm] =	0.714	
SM_O [cm^3] =	0.2760	0.0978
SM_I [cm^3] =	0.2357	0.1037
I [cm^4] =	0.1970	0.1748
Thickness [mm]	13.250	10.053
Sand. weight, [Kg/m^2] =	7.589	

Lower Panel 10 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.250	1.000	0.250	0.125	0.001	0.031	0.004
Core	1.000	1.000		0.750			
Inner Skin	0.200	1.000	0.200	1.350	0.001	0.270	0.365
Total =	1.450		0.450		0.002	0.301	0.368

d_{NA} [cm] =	0.669	
SM_O [cm^3] =	0.2520	0.0875
SM_I [cm^3] =	0.2161	0.0927
I [cm^4] =	0.1687	0.1478
Thickness [mm]	12.250	8.872
Sand. weight, [Kg/m^2] =	7.504	

Upper Panel 1 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.200	1.000	0.200	0.100	0.001	0.020	0.002
Core	0.800	1.000		0.600			
Inner Skin	0.200	1.000	0.200	1.100	0.001	0.220	0.242
Total =	1.200		0.400		0.001	0.240	0.244

d_{NA} [cm] =	0.600	
SM_O [cm^3] =	0.1689	0.0459
SM_I [cm^3] =	0.1689	0.0486
I [cm^4] =	0.1013	0.0533
Thickness [mm]	10.000	5.411
Sand. weight, [Kg/m^2] =	6.595	

Upper Panel 2 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.250	1.000	0.250	0.125	0.001	0.031	0.004
Core	0.800	1.000		0.650			
Inner Skin	0.200	1.000	0.200	1.150	0.001	0.230	0.265
Total =	1.250		0.450		0.002	0.261	0.268

d_{NA} [cm] =	0.581	
SM_O [cm^3] =	0.2045	0.0668
SM_I [cm^3] =	0.1773	0.0708
I [cm^4] =	0.1187	0.0936
Thickness [mm]	10.250	8.348
Sand. weight, [Kg/m^2] =	7.334	

Upper Panel 3 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.250	1.000	0.250	0.125	0.001	0.031	0.004
Core	0.900	1.000		0.700			
Inner Skin	0.200	1.000	0.200	1.250	0.001	0.250	0.313
Total =	1.350		0.450		0.002	0.281	0.316

d_{NA} [cm] =	0.625	
SM_O [cm^3] =	0.2282	0.0816
SM_I [cm^3] =	0.1967	0.0864
I [cm^4] =	0.1426	0.1264
Thickness [mm]	11.250	9.683
Sand. weight, [Kg/m^2] =	7.419	

Upper Panel 4 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.250	1.000	0.250	0.125	0.001	0.031	0.004
Core	1.100	1.000		0.800			
Inner Skin	0.200	1.000	0.200	1.450	0.001	0.290	0.421
Total =	1.550		0.450		0.002	0.321	0.424

d_{NA} [cm] =	0.714	
SM_O [cm^3] =	0.2760	0.1043
SM_I [cm^3] =	0.2357	0.1106
I [cm^4] =	0.1970	0.1828
Thickness [mm]	13.250	11.687
Sand. weight, [Kg/m^2] =	7.589	

Upper Panel 5 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.300	1.000	0.300	0.150	0.002	0.045	0.007
Core	1.200	1.000		0.900			
Inner Skin	0.200	1.000	0.200	1.600	0.001	0.320	0.512
Total =	1.700		0.500		0.003	0.365	0.519

d_{NA} [cm] =	0.730	
SM_O [cm^3] =	0.3496	0.1088
SM_I [cm^3] =	0.2631	0.1153
I [cm^4] =	0.2552	0.1946
Thickness [mm]	14.500	12.188
Sand. weight, [Kg/m^2] =	8.413	

Upper Panel 6 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.250	1.000	0.250	0.125	0.001	0.031	0.004
Core	1.100	1.000		0.800			
Inner Skin	0.200	1.000	0.200	1.450	0.001	0.290	0.421
Total =	1.550		0.450		0.002	0.321	0.424

d_{NA} [cm] =	0.714	
SM_O [cm^3] =	0.2760	0.1065
SM_I [cm^3] =	0.2357	0.1129
I [cm^4] =	0.1970	0.1886
Thickness [mm]	13.250	11.854
Sand. weight, [Kg/m^2] =	7.589	

Upper Panel 7 Sandwich

	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]		
Outer skin	0.250	1.000	0.250	0.125	0.001	0.031	0.004
Core	1.100	1.000		0.800			
Inner Skin	0.200	1.000	0.200	1.450	0.001	0.290	0.421

d_{NA} [cm] =	0.714	
SM_O [cm^3] =	0.2760	0.1021
SM_I [cm^3] =	0.2357	0.1082
I [cm^4] =	0.1970	0.1771
Thickness [mm]	13.250	11.520

Total =	1.550		0.450		0.002	0.321	0.424	Sand. weight, [Kg/m^2] =	7.589	
			Upper Panel 8 Sandwich					d_{NA} [cm] =	0.669	
	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]			SM_O [cm^3] =	0.2520	0.0936
Outer skin	0.250	1.000	0.250	0.125	0.001	0.031	0.004	SM_I [cm^3] =	0.2161	0.0992
Core	1.000	1.000		0.750				I [cm^4] =	0.1687	0.1554
Inner Skin	0.200	1.000	0.200	1.350	0.001	0.270	0.365	Thickness [mm]	12.250	10.852
Total =	1.450		0.450		0.002	0.301	0.368	Sand. weight, [Kg/m^2] =	7.504	
			Upper Panel 9 Sandwich					d_{NA} [cm] =	0.650	
	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]			SM_O [cm^3] =	0.1882	0.0777
Outer skin	0.200	1.000	0.200	0.100	0.001	0.020	0.002	SM_I [cm^3] =	0.1882	0.0824
Core	0.900	1.000		0.650				I [cm^4] =	0.1223	0.1176
Inner Skin	0.200	1.000	0.200	1.200	0.001	0.240	0.288	Thickness [mm]	11.000	9.683
Total =	1.300		0.400		0.001	0.260	0.290	Sand. weight, [Kg/m^2] =	6.680	
			Upper Panel 10 Sandwich					d_{NA} [cm] =	0.600	
	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]			SM_O [cm^3] =	0.1689	0.0459
Outer skin	0.200	1.000	0.200	0.100	0.001	0.020	0.002	SM_I [cm^3] =	0.1689	0.0486
Core	0.800	1.000		0.600				I [cm^4] =	0.1013	0.0533
Inner Skin	0.200	1.000	0.200	1.100	0.001	0.220	0.242	Thickness [mm]	10.000	5.259
Total =	1.200		0.400		0.001	0.240	0.244	Sand. weight, [Kg/m^2] =	6.595	
			Deck Station 1 Sandwich					d_{NA} [cm] =	0.500	
	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]			SM_O [cm^3] =	0.1307	0.0225
Outer skin	0.200	1.000	0.200	0.100	0.001	0.020	0.002	SM_I [cm^3] =	0.1307	0.0238
Core	0.600	1.000		0.500				I [cm^4] =	0.0653	0.0251
Inner Skin	0.200	1.000	0.200	0.900	0.001	0.180	0.162	Thickness [mm]	8.000	5.411
Total =	1.000		0.400		0.001	0.200	0.164	Sand. weight, [Kg/m^2] =	6.425	
			Deck Station 2 Sandwich					d_{NA} [cm] =	0.600	
	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]			SM_O [cm^3] =	0.1689	0.0326
Outer skin	0.200	1.000	0.200	0.100	0.001	0.020	0.002	SM_I [cm^3] =	0.1689	0.0346
Core	0.800	1.000		0.600				I [cm^4] =	0.1013	0.0438
Inner Skin	0.200	1.000	0.200	1.100	0.001	0.220	0.242	Thickness [mm]	10.000	8.348
Total =	1.200		0.400		0.001	0.240	0.244	Sand. weight, [Kg/m^2] =	6.595	
			Deck Station 3 Sandwich					d_{NA} [cm] =	0.600	
	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]			SM_O [cm^3] =	0.1689	0.0294
Outer skin	0.200	1.000	0.200	0.100	0.001	0.020	0.002	SM_I [cm^3] =	0.1689	0.0311
Core	0.800	1.000		0.600				I [cm^4] =	0.1013	0.0374
Inner Skin	0.200	1.000	0.200	1.100	0.001	0.220	0.242	Thickness [mm]	10.000	9.683
Total =	1.200		0.400		0.001	0.240	0.244	Sand. weight, [Kg/m^2] =	6.595	
			Cockpit Sandwich					d_{NA} [cm] =	0.714	
	Thick. [cm]	Width [cm]	Area [cm^2]	Center [cm]	I_0 [cm^4]			SM_O [cm^3] =	0.2760	0.0811
Outer skin	0.250	1.000	0.250	0.125	0.001	0.031	0.004	SM_I [cm^3] =	0.2357	0.0859
Core	1.100	1.000		0.800				I [cm^4] =	0.1970	0.1715
Inner Skin	0.200	1.000	0.200	1.450	0.001	0.290	0.421	Thickness [mm]	13.250	11.687
Total =	1.550		0.450		0.002	0.321	0.424	Sand. weight, [Kg/m^2] =	7.589	

	Shell below 25.1 cm above DWL									
	Bow	5% of LWL aft of FP		40% of LWL aft of FP						Stern
x [m] =	6.708	5.760	1.800	1.280	-0.600	-2.560	-3.840	-5.120	-6.400	-7.292
Outer s. [cm]	0.200	0.200	0.300	0.350	0.350	0.300	0.300	0.300	0.250	0.250
Core [cm]	0.700	0.800	1.200	1.400	1.500	1.400	1.200	1.200	1.100	1.000
Inner s. [cm]	0.200	0.200	0.250	0.250	0.250	0.200	0.250	0.200	0.200	0.200
	Shell Above 25.1 cm above DWL									
	Bow	5% of LWL aft of FP		40% of LWL aft of FP						Stern
x [m] =	6.708	5.760	1.800	1.280	-0.600	-2.560	-3.840	-5.120	-6.400	-7.292
Outer s. [cm]	0.200	0.250	0.250	0.250	0.300	0.250	0.250	0.250	0.200	0.200
Core [cm]	0.800	0.800	0.900	1.100	1.200	1.100	1.100	1.000	0.900	0.800
Inner s. [cm]	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200