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Sound Boats

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M/V SCAPHA

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Vessel Particulars

LOA (including swimstep)	83.84 ft.
LWL (8.25" above Hargrave's)	65.50 ft.
BEAM	20.25 ft.
BEAM LWL	18.25 ft.
DRAFT	6.00 ft.
Midship Draft (fairbody)	4.29 ft.
Station Spacing	6.58 ft.
Scale of Lines Drawing	1/2"=1'0"
Scale Factor (1/scale^2)	4

Hydrostatic Summary

Note: hydrostatic calcs. based new waterline parallel to Hargrave's DWL and 8.25" above it.

Displacement	160,187 lbs.
Displacement	72 long tons
Displacement volume	2,503 cubic ft.
DLR	251
LCB	0.574
LCF	0.565
PPI (lbs)	5,228 lbs.
Moment Trim 1" (calculated)	16,703 ft-lbs

Coefficients of Form

Prismatic:	$C_p = \text{displacement volume} / \text{LWL} \times \text{area of largest underwater section}$
	= 0.75
Block:	$C_b = \text{displacement volume} / \text{LWL} \times \text{WL BEAM} \times \text{Midship Draft}$
	= 0.49
Waterplane:	$C_w = \text{waterplane area} / \text{LWL} \times \text{WL BEAM}$
	= 0.82
Midship:	$C_m = \text{midship area} / \text{midship WL BEAM} \times \text{Midship Draft}$
	= 0.65

Planimeter Readings

Half Section Areas (sq. in.)

Station	First	Second	Third	Average
0	0.00	0.00	0.00	0.00
1	1.45	1.55	1.68	1.56
2	3.40	3.45	3.42	3.42
3	4.80	4.70	4.73	4.74
4	5.92	5.94	5.90	5.92
5	6.35	6.45	6.25	6.35
6	6.37	6.40	6.39	6.39
7	6.09	5.99	6.08	6.05
8	5.59	5.46	5.50	5.52
9	5.28	5.10	5.08	5.15
10	4.74	4.70	4.69	4.71

Station	1/2 Area	S. Multiplier	S. Function	Station	S. Moments
0	0.00	1	0	0	0
1	1.56	4	6	1	6
2	3.42	2	7	2	14
3	4.74	4	19	3	57
4	5.92	2	12	4	47
5	6.35	4	25	5	127
6	6.39	2	13	6	77
7	6.05	4	24	7	169
8	5.52	2	11	8	88
9	5.15	4	21	9	186
10	4.71	1	5	10	47
Column Totals			143		

Displacement Volume (ft³) = (sum of S. Functions x Station Spacing x Scale Factor x 2)/3
 = 2,503 ft³

Density of Seawater = 64 lbs/ft³

Displacement in lbs = 160,187 lbs

Displacement in Long Tons = (displacement in lbs/2240)

= 72 L.T.

LCB = (sum of S. Moments/sum of S. Functions/10)

= 0.57

DLR = Disp. In L.T./ (.01 x LWL)³

= 251

Table of WL Half Breadths (ft.)

Station	Half Breadth (ft.)	S. Multiplier	S. Function	Station	S.Moments
0	0.00	1	0	0	0
1	3.42	4	14	1	14
2	6.25	2	13	2	25
3	7.73	4	31	3	93
4	8.67	2	17	4	69
5	9.08	4	36	5	182
6	9.00	2	18	6	108
7	8.92	4	36	7	250
8	8.71	2	17	8	139
9	8.38	4	34	9	302
10	8.08	1	8	10	81
Column Totals			223		1262

Waterplane Area (ft³) = (sum of S. Functions x Station Spacing x 2)/3
 = 980 sq. ft.
 LCF = (sum of S. Moments/sum of S. Functions)/10
 = 0.56
 Pounds Per Inch Immersion = (waterplane area x 64 lbs/ft³)/12
 = 5,228 lbs

Moment to Trim 1"

Moment to Trim 1" = (displ. Lbs x long. metacentric height)/(12 x LWL)
 *long. metacentric radius (BMlong.) can be substituted for metacentric height (GM long.) for estimation purpose
 long. Moment of inertia = (.04 x BWL x LWL³)
 = 205,138 ft⁴
 BMlong. = Ilong./displacement volume
 = 82 ft
 Moment to Trim 1" = 16703 ft-lbs.