INCLINING EXPERIMENT

ON

179'-6" x 36' x 15

RESEARCH VESSEL "GYRE"

HALTER MARINE HULL 375

FOR

TEXAS A & M UNIVERSITY

GALVESTON, TEXAS

APRIL 16, 1984

DWG. NO. 2042-D4

ALT. 1

schuller & allan, inc

NAVAL ARCHITECTS • MARINE CONSULTANTS

5012 TELEPHONE

PHONE: 644-3251 • TELEX 76-2726

HOUSTON, TEXAS 77087-3598

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ALT. 1 SINGH 06/15/84
CHANGED TO REFLECT COMMENTS
OF U.S.C.G. LETTER SER H2-6443
DATED 25 MAY 1984

SCHULLER & ALLAN, INC.
NAVAL ARCHITECTS • MARINE ENGINEERS
5012 TELEPHONE ROAD
HOUSTON, TEXAS 77087 PHONE 713-644-3251

STABILITY TEST DATA

R/V "GYRE"

OFFICIAL No. TX 2980CJ

Gross tons 286

Description of vessel 179'-6" x 36' x 15'

Type RESEARCH VESSEL

Builder HALTER MARINE SERVICES, INC.

Hull No. 375 Date Built 1972-73 (MODIFIED 1984

Hull ALL WELDED STEEL
TRANSVERSELY FRAMED

Machinery TWIN DIESELS CAT-D-398-D (850 HP)

Classed by ABS Inspected ☐ Safety certificate ☐ Load line ☒

Route: Ocean ☒ Coastwise ☐ Great Lakes ☐ Bays ☐ Rivers ☐

Specify route, if limited

Owner TEXAS A&M UNIVERSITY

Owner's address GALVESTON, TEXAS

Vessel inclined at TEXAS A&M GALVESTON

Date 3/30/84 Time 8:00 AM TO 5:30 PM

Test requested by OWNER

Plans furnished by BUILDER

Offsets measured by BUILDER

Curves of form computed by SCHULLER AND ALLAN, INC.

Test conducted by SCHULLER AND ALLAN, INC.

Stability calculations made by SCHULLER AND ALLAN, INC.

Duplicate vessels

STABILITY TEST 179'-6" x 36' x 15' R/V "GYRE"

PRINCIPAL DIMENSIONS

Length over all			179	feet	6	inches (179.50 feet).
Length between perpendiculars which are at the extremities of 10' water line			171	feet	0	inches (171.00 feet).
Length between draft marks, ____ condition			136	feet	0	inches (136.00 feet).
Breadth, extreme, at ____ feet ____ inches above base			36	feet	3/4	inches (36.06 feet).
Breadth, molded, ℄ at 15 feet 0 inches above base			36	feet	0	inches (36.00 feet).
Breadth at load water line AMIDSHIPS			36	feet	0	inches (36.00 feet).
Depth amidships, from MLD. BASELINE to MLD MD			15	feet	0	inches (15.00 feet).
Apparent full-load mean draft for stability	molded base		11	feet	6	inches (11.50 feet).
	bottom of keel		11	feet	6 1/2	inches (11.54 feet).
Displacement, sea water, long tons (2,240 lb.), at above full-load draft			1213.20	tons.		
Freeboard amidships at above full-load draft				feet		inches (feet).
Freeboard at low point of sheer (feet aft of ℄)				feet		inches (feet).
Location of ports, in hull, which may affect stability						

GENERAL INFORMATION

Names and duties of official observers	LCDR. M.M. ASHDOWN - U.S.C.G., D. SINGH, K. DUGAS - SCHULLER & ALLAN
Designers represented by	
Builders represented by	
Owners represented by	DEAN LETZRING - TEXAS A&M UNIVERSITY
Weather, tide, and mooring conditions	CLEAR SKY, 0-5 KNOTS WIND FROM PORT STERN LINES SLACK
Condition of ship as to completeness and as to water in boilers, machinery, and bilges	VESSEL COMPLETE, ENGINES WET, BILGES DRY

STABILITY TEST 179'-6" × 36' × 15' R/V "GYRE"

All tons used in this calculation are of .... pounds

SHIP AT TIME OF STABILITY TEST—CONDITION O

SEE SKETCH ON PAGE 6

SKETCH SHOWING HOG, SAG, TRIM, DRAG, AND LOCATION OF DRAFT MARKS, FREEBOARDS, AND PERPENDICULARS

Draft from draft marks when inclined.	Forward PORT	8 feet	6 inches.	
	FORWARD STBD	8	8	
	Aft STBD	9 feet	10 inches.	
	Amidships Port	feet	inches.	
	Amidships Starboard	feet	inches.	

Distance between "curves of form" perpendiculars .... 171.000 feet.

Bottom of keel below base line .... inches.

Molded [redacted] drafts corrected to "curves of form" perpendiculars for use in calculations.	Forward	8.53	feet.
	Aft	9.85	feet.
	Mean of amidships P and S		feet.

Mean of forward and after drafts .... 9.19 feet.

Hog [redacted] Ⓒ ⊗ .... 0.18 feet.

Trim [redacted] aft .... 1.32 feet.

Longitudinal center of flotation forward, aft ⊗ .... feet.

Molded / Keel draft at center of flotation .... feet.

Molded / Keel draft at L. C. F. corrected for hog or sag .... feet.

Total displacement at above draft F. W., S. W. .... tons.

Specific gravity of water 1.020 equals 35.25 cubic feet per ton.

Total displacement corrected for density .... 853.50 tons. FROM COMPUTER OUTPUT PAGE 8

179'-6" x 36' x 15' RESEARCH VESSEL "GYRE"
HALTER MARINE HULL NO. 375

schuller & allan, inc. date _____ by SINGH file 2042

DEADWEIGHT SURVEY DATA

LOCATION (FR)	DIST. FROM F.P. (FT)	MEAN F.B. CORR. FOR OK TH. (FT)	DECK (MLD.) (FT)	DRAFT (MLD.) (FT)
7	6.00	16.04	24.56	8.52
18	28.00	15.16	23.88	8.72
30	52.00	14.31	23.13	8.82
40	72.00	5.99	15.00	9.01
54	100.00	5.84	15.00	9.16
64	120.00	5.69	15.00	9.31
74	140.00	5.51	15.00	9.49
84	160.00	5.16	15.00	9.84

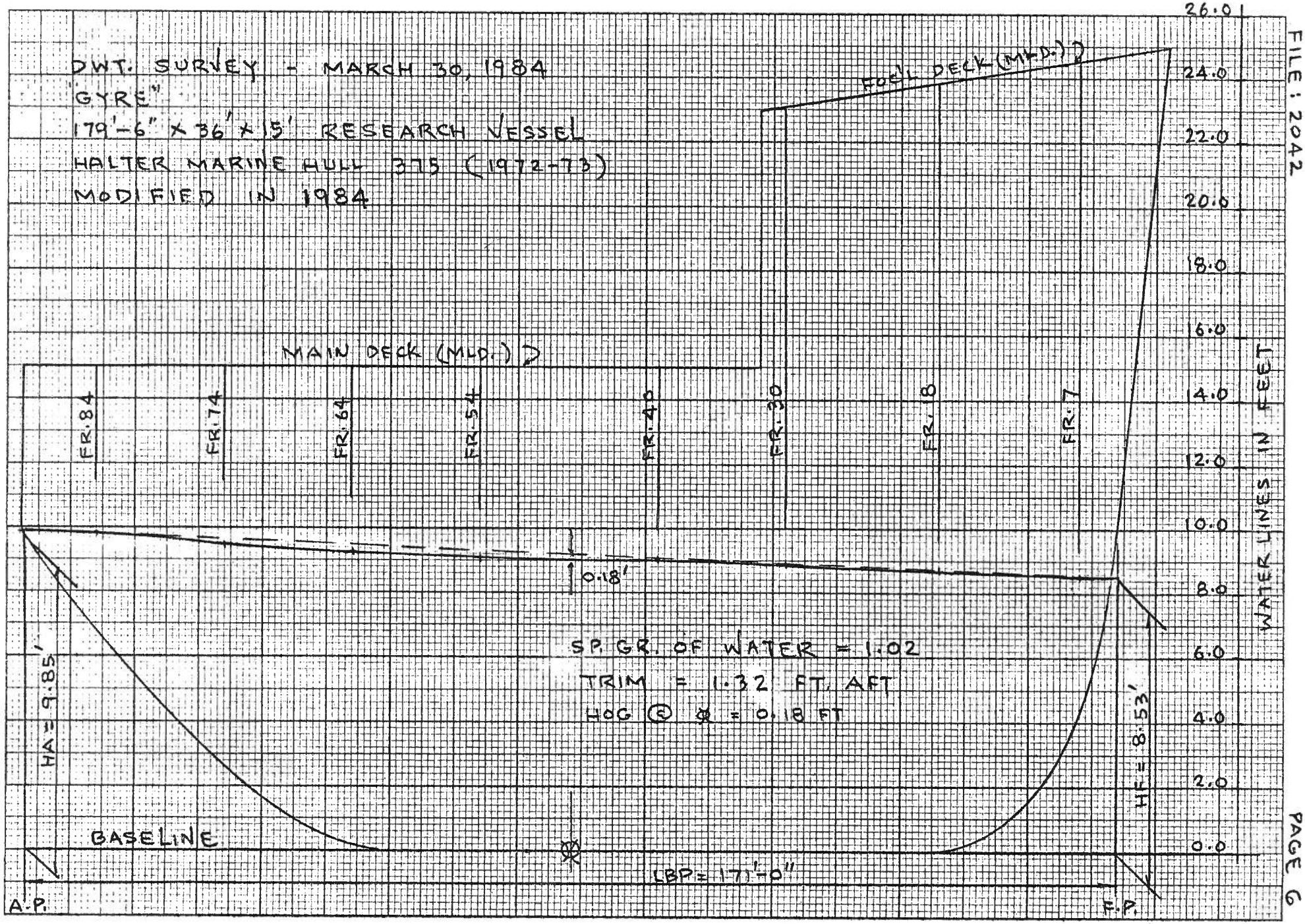
THE ABOVE DRAFTS ARE PLOTED ON PAGE 6, RESULTING IN THE FOLLOWING DATA

DRAFT AT

F.P. = 8.53'
⊄ = 9.19'
A.P. = 9.85
TRIM = 1.32' AFT
HOG = 0.18' @ ⊄

DECK THICKNESS USED IN CORRECTING THE FREE BOARD READINGS.

MAIN DECK = 3/8" (FR. 0 TO FR. 35 1/2)
= 5/8" (FR. 35 1/2 TO TRANS)
FOC'L = 5/16"



HYDROSTATICS

UNITS AND DEFINITIONS

CIDOFTS	CHANGE IN DISPLACEMENT FOR ONE FOOT TRIM BY STERN IN TONS
DISPLACEMENT	DISPLACEMENT IN TONS (35.25)
DRAFT	HEIGHT ABOVE BASELINE IN FEET AMIDSHIPS
KB	HEIGHT OF CENTER OF BUOYANCY ABOVE BASELINE IN FEET
LCB	LONGITUDINAL CENTER OF BUOYANCY IN FEET FROM AMIDSHIPS (+ FWD)
LCF	LONGITUDINAL CENTER OF FLOATATION IN FEET FROM AMIDSHIPS (+ FWD)
LONG.BM	LONGITUDINAL BM IN FEET
LONG.KM	LONGITUDINAL KM IN FEET
MT1	MOMENT TO CHANGE TRIM ONE INCH IN FOOT TONS
PRISMATIC	PRISMATIC COEFFICIENT - VOLUME/(LBP X AREA*)
TPI	TONS PER INCH IMMERSION
TRNSV BM	TRANSVERSE BM IN FEET
TRNSV KM	TRANSVERSE KM IN FEET
VOLUME	DISPLACED VOLUME IN CUBIC FEET
WETTED SURFACE	SURFACE AREA OF WETTED PORTION OF HULL IN SQUARE FEET
WPLANE AREA	AREA OF WATERPLANE IN SQUARE FEET
WPLANE COEF	WATERPLANE COEFFICIENT - WATERPLANE AREA/(LBP X BEAM*)
WPLANE I COEF	INERTIA COEFT - WPLANE TRANS INTERIA/(LBP X BEAM*CUBED/12)

AREA* AND BEAM* ARE PROPERTIES AT THE TABULATED DRAFT
OF THE STATION OF MAXIMUM AREA AT DESIGN DRAFT

179'-6" X 36' X 15' "GYRE" HALTER MARINE HULL NO. 375 FILE 2042

HYDROSTATICS - PART I TRIM 1.320 FEET & HOG OF 0.18' @ ⊗

DRAFT	VOLUME	DISPLACEMENT	LCB	KB	WETTED SURFACE	PRISMATIC COEF	WPLANE COEF	WPLAN I COE
9.19	30086.	853.5	.06	5.53	6467.	.618	.817	.69

HYDROSTATICS - PART II TRIM 1.320 FEET

DRAFT	WPLANE AREA	LCF	TPI	CIDOFTS	LONG. BM	TRNSV BM	LONG. KM	TRNSV KM	MT1
9.19	5034.	-7.59	11.90	6.34	297.2	15.39	302.7	20.91	123.

SCHULLER & ALLAN, INC. Page

STABILITY TEST 179'-6" x 36' x 15' RESEARCH VESSEL "GYRE"

SHIP AT TIME OF STABILITY TEST—CONDITION O

PENDULUMS

No.	Location	Length to Batten (Inches)
1st	EMERGENCY ESCAPE HATCH FR. 16	170.750
2d	AFT. OF DECK HOUSE PORT	172.250
3d	AFT OF DECK HOUSE STBD	170.063

INCLINING WEIGHTS

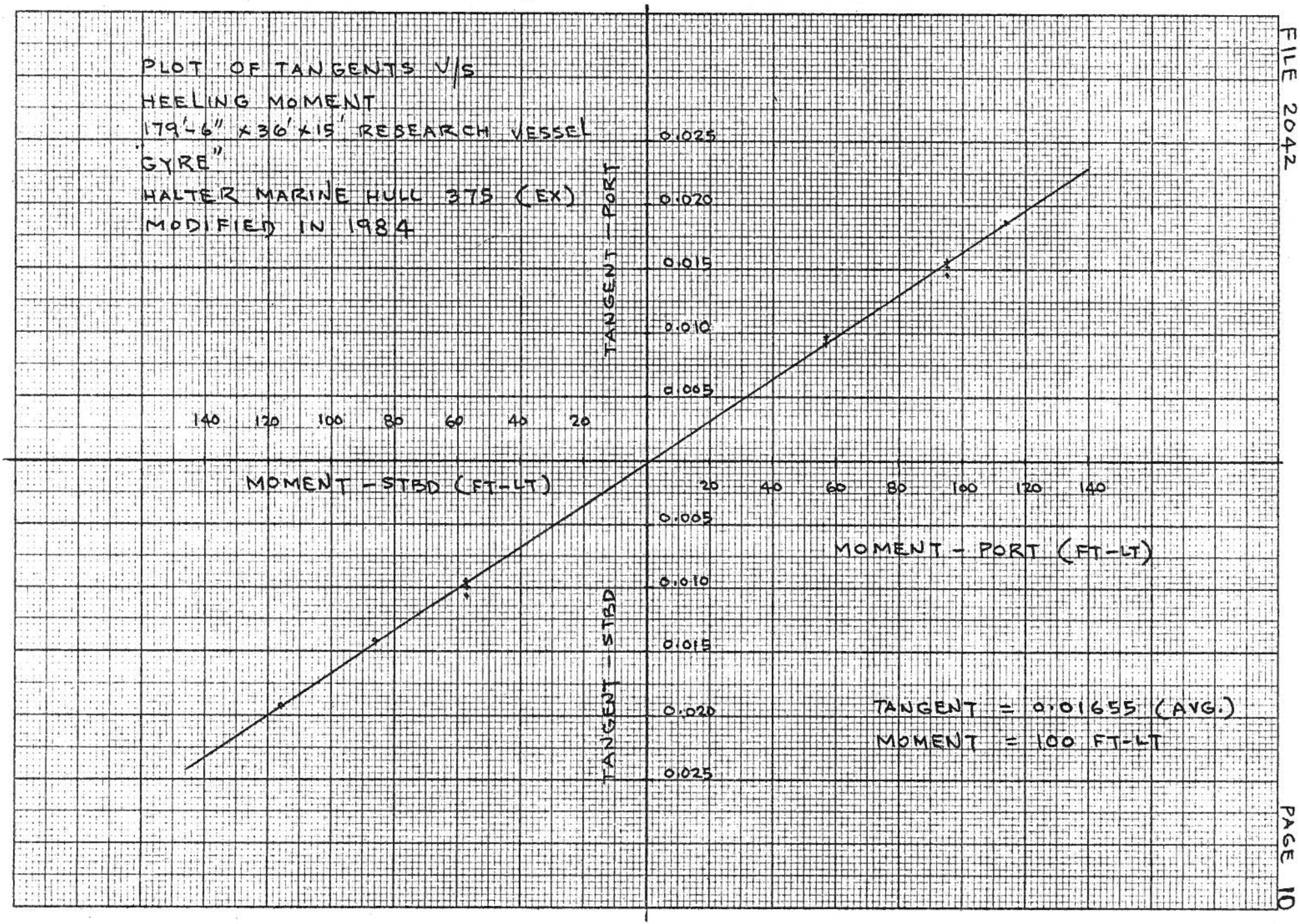
Location ON MAIN DECK AT FRAME 81 1/2

Description CONCRETE BLOCKS

Weight No.	Weight (Tons)	Initial Position Port (Feet)	Initial Position Starboard (Feet)
1	5.2500	2.00	
3	5.1964		2.00

	Weight No.	Weight (Tons)	Distance From Initial Position Port (Feet)	Distance From Initial Position Starboard (Feet)	Moment (Ft.-tons)	Total Inclining Moment Port (Ft.-tons)	Total Inclining Moment Starboard (Ft.-tons)	Pendulum Deflections No.	Pendulum Deflections Port (Inches)	Pendulum Deflections Starboard (Inches)	Tangent Port	Tangent Starb.
1st trial	1	5.2500	10.81		56.75	56.75		1st	1.60		0.0094	
								2d	1.68		0.0098	
								3d	1.65		0.0097	
2d trial	1	5.2500	10.81		56.75	95.31		1st	2.60		0.0152	
	3	5.1964	7.42		38.56			2d	2.52		0.0146	
								3d	2.65		0.0156	
3d trial	1	5.2500	10.81		56.75	112.92		1st	3.19		0.0187	
	3	5.1964	10.81		56.17			2d	3.22		0.0187	
								3d	3.20		0.0188	
4th trial	1	5.2500		11.05	58.01		115.54	1st		3.30		0.019
	3	5.1964		11.07	57.52			2d		3.30		0.019
								3d		3.25		0.0191
5th trial	1	5.2500		5.48	28.77		86.29	1st		2.42		0.014
	3	5.1964		11.07	57.52			2d		2.45		0.014
								3d		2.40		0.014
6th trial	1	5.2500	0.00				57.52	1st		1.70		0.0100
	3	5.1964		11.07	57.52			2d		1.82		0.0100
								3d		1.62		0.009
7th trial								1st				
								2d				
								3d				
8th trial								1st				
								2d				
								3d				

PLOT OF TANGENTS V/S
HEELING MOMENT
179'-6" x 36' x 15' RESEARCH VESSEL
"GYRE"
HALTER MARINE HULL 375 (EX)
MODIFIED IN 1984



SCHULLER & ALLAN, INC.

STABILITY TEST 179'-6" x 36' x 15' R/V "GYRE"

Page

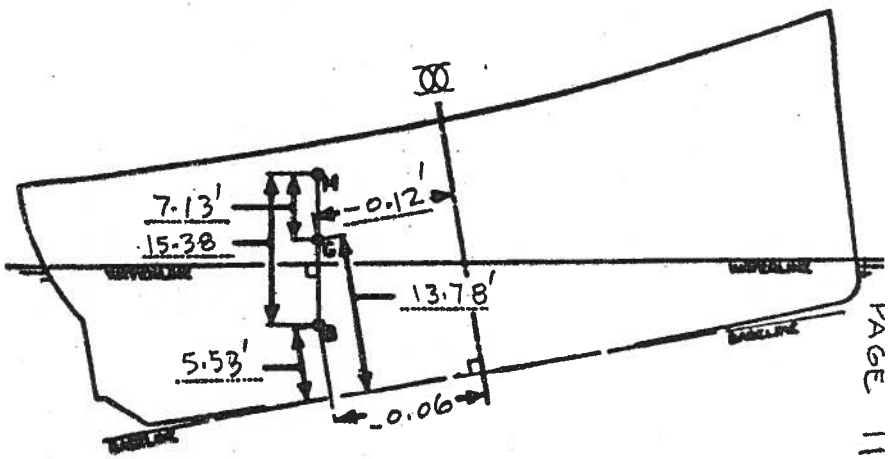
SHIP AT TIME OF STABILITY TEST—CONDITION ●

	FROM HYDROSTATIC CURVES	FROM INDEPENDENT CALCULATION
Corrected displacement	tons.	853.50 tons.
Mean virtual metacentric height obtained from plot of inclining moments versus tangents of angles of heel ... moment / displacement × tangent = 100 / 853.50 × 0.01655	feet.	7.08 feet.
Correction for free surface = 39.70 / 853.50	feet.	0.05 feet.
Mean metacentric height G. M. =	feet.	7.13 feet.
Transverse metacenter above base line corresponding to draft at L. C. F. (corrected for hog or sag)	feet.	
Transverse metacenter above base line corrected (for trim, and hog or sag)	feet.	20.91 feet. FROM PAGE 8
C. G. above base line	feet.	13.78 feet.
Longitudinal metacenter above C. G.	feet.	
Moment to alter trim 1 foot, Longl. GM × Δ / L	ft.-tons.	
Trim by stern, bow	feet.	
Trimming lever = Trim × moment to trim / displacement	feet.	
L. C. B., forward, aft of M, which is ... feet forward, aft of frame No.	feet.	
C. G. forward, aft of M	feet.	0.12 feet. FWD OF ⊗

LCG UNCORRECTED FOR TRIM
= 0.06 FT FWD. OF ⊗

CORR. = (13.78 - 5.53) 1.32 / 171.0C

= 0.06 FT



Period of complete roll ... seconds.

Apparent radius of gyration of vessel ... $a = \frac{T\sqrt{GM}}{1.108}$ ... feet.

Rolling constant ... $C = \frac{T\sqrt{GM}}{B}$

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STABILITY TEST 179'-6" x 36' x 15' R/V "GYRE"

DATA FOR TANKS				ITEMS (Include list of tanks completely empty)	WEIGHT Tons	C. G. ABOVE BASE		C. G. FROM M. P.			
LIQUID	SOUND'G	Net Inertia of Free Surface	INERTIA FEET³/TON			LEVER	VERTICAL MOMENTS Ft.-tons	FEET AFT	AFTER MOMENTS Ft.-tons	FEET FOR'D	FORWARD MOMENTS Ft.-tons
L.O.	8.25'		0.50	L.O. PORT	2.87	6.56	19	10.75	31		
L.O.	8.50'		0.50	L.O. PORT	2.96	6.69	20	14.75	44		
L.O.	10.92'		0.50	L.O. STBD	3.84	7.90	30	14.75	57		
F.O.	8.92'		2.05	F.O.D. PORT	12.33	7.09	87	24.59	303		
F.O.	8.92'		2.05	F.O.D. STBD	12.33	7.09	87	24.59	303		
S.W.	9.25'	35.25 CUFT/LT	34.10	4 F.O. STBD	38.61	8.36	323	45.75	1766		
	TOTAL	TANKAGE	39.70		72.94		566		2504		

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179'-6" x 36' x 15' RESEARCH VESSEL "GYRE"

HALTER MARINE HULL NO. 375

schuller & allan, inc. date _____ by SINGH file 2042

WEIGHTS TO DEDUCT

ITEM	WEIGHT (LT)	VCG (FT. ABV. BL)	V. MOM'T (FT-LT)	LCG FT (+ FWD)	L. MOM'T (FT-LT)
INCLINING WT #1	5.25	17.50	92	-69.50	-365
INCLINING WT #3	5.20	17.50	91	-69.50	-361
EXTRA WT #2	4.41	17.17	76	-50.50	-223
MEN (5) @ 165# EACH	0.37	18.00	7	-50.50	-19
OIL BUCKET 1	0.07	16.00	1	61.50	4
OIL BUCKET 2	0.07	16.00	1	-30.50	-2
OIL BUCKET 3	0.07	16.00	1	-30.50	-2
TANKAGE	72.94		566		-2504
TOTAL	88.38	9.45	835	-39.28	-3472

SCHULLER & ALLAN, INC.

STABILITY TEST 179'-6" x 36' x 15' R/V "GYRE"

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SHIP LIGHT—CONDITION I

Ship complete in every respect, with water in boilers at steaming level and liquids in machinery and piping, but with all tanks and bunkers empty and no passengers, crew, cargo, stores, or baggage on board

ITEMS	DISPLACEMENT AND WEIGHT Tons	C. G. ABOVE BASE		C. G. FROM M. P.			
		LEVER	VERTICAL MOMENTS Ft.-tons	FEET AFT	AFTER MOMENTS Ft.-tons	FEET FOR'D	FORWARD MOMENTS Ft.-tons
Ship in Condition O	853.50	13.78	11761			0.12	102
Weight to complete							
Foreign weight—to be deducted	88.38		− 835		− 3472		
Ship in Condition I	765.12	14.28	10926			4.67	3574

Molded keel } draft at longitudinal center of flotation corresponding to above displacement for ..... water— ..... feet.

Transverse metacenter above base at L. C. F. draft, uncorrected for trim ..... feet.

Transverse metacenter above base, corrected for trim ..... feet.

C. G. above base ..... feet.

Metacentric height, uncorrected for trim, G. M ..... feet.

Metacentric height, corrected for trim, G. M ..... feet.

Longitudinal metacenter above C. G. at L. C. F. draft ..... feet.

Moment to alter trim 1 foot at L. C. F. draft, $\frac{\text{Long'l. GM} \times \Delta}{L}$ ..... feet-tons.

C. B. of ship on even keel at L. C. F. draft, aft, forward of ⊠ ..... feet.

C. G. aft, forward of ⊠ ..... feet.

Trimming lever ..... feet.

Trim, $\frac{\text{Displacement} \times \text{lever}}{\text{Moment to trim}}$ forward ..... 1.136 feet.

Longitudinal center of flotation, aft, forward of ⊠ ..... feet

Difference between L. C. F. and ⊠ draft ..... feet

Molded draft amidships ..... 8.42 feet

Draft on F.P. [redacted] forward (8.99') 8 feet 11 7/8 inches

Draft on A.P. [redacted] aft (7.85') 7 feet 10 1/4 inches

SEE COMPUTER OUTPUT ON PAGE 15

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DESIGN DISPLACEMENT	765.120	TONS (LT-SW)
DESIGN LCG	4.670	FEET FROM AMIDSHIPS (+FWD)
DESIGN DRAFT	8.424	FEET
DESIGN TRIM	-1.136	FEET (+ BY STERN)
LENGTH OVERALL	179.500	FEET
LENGTH BETWEEN PERPENDICULARS	171.000	FEET
LENGTH ON DESIGN WATERLINE	160.656	FEET
STATION OF MAX AREA (AT DWL)	73.433	FEET FROM FP
BEAM AT STATION OF MAX AREA	36.150	FEET
SECTION AREA COEFFICIENT	.8475	
PRISMATIC COEFFICIENT	.6011	
BLOCK COEFFICIENT	.5094	

HYDROSTATICS - PART I TRIM -1.136 FEET

DRAFT	VOLUME	DISPLACEMENT	LCB	KB	WETTED SURFACE	PRISMATIC COEF	WPLANE COEF	WPLAN I COE
8.42	26780.	765.2	4.67	5.12	5913.	.601	.749	.62

HYDROSTATICS - PART II TRIM -1.136 FEET

DRAFT	WPLANE AREA	LCF	TPI	CIDOFTS	LONG. BM	TRNSV BM	LONG. KM	TRNSV KM	MT1
8.42	4629.	-1.69	11.02	1.31	261.4	15.85	266.5	20.97	97.