UNITED STATES NAVAL ACADEMY HYDROMECHANICS LABORATORY (NAHL)
EXPERIMENT PLANNING & PREPARATION FORM

Purpose: This mandatory form serves to inform NAHL staff of proposed research/experimentation requiring any technical and facility support. This form also serves to guide/organize student and faculty experiment brainstorming/development efforts.

Name	
E-Mail Address	
Department	
Advisor/Sponsor Name	
Experiment Type	☐ Regular Class/Course ☐ Capstone Project ☐ Independent/Honors Research Project ☐ Faculty/Sponsored Research
Course Number (If Applicable)	

Experiment Title

Problem Statement/Goals

Hypothesis/Expected Results

Nature Of Technical/Facility Support (As Applicable)
☐ General Engineering Consultation/Brainstorming
☐ Computational Support (Microsoft Excel, MATLAB, MaxSurf, Rhinoceros, SolidWorks)
☐ Detailed Prototype Design (Design For Fabrication/Manufacturability)
☐ Part/Component Ordering/Acquisition
☐ 120-Foot Towing Tank
☐ 380-Foot Towing Tank
☐ Dry Dock (End Of 380-Foot Towing Tank)
☐ Ballast Tank
☐ Re-Circulating Water Channel
☐ Coastal Engineering Laboratory
☐ Other Support (To Be Discussed With NAHL Staff)

Nature Of Instrumentation/Data Measurement		
Parameter/Variable	**Instrument**	**Instrument Range/Capacity**
e.g. Model Resistance ($R_{T,\ MODEL}$) (LB)	*e.g. 2 IN Block Gage (Force Block)*	*e.g. 0 LB – 10 LB*

Towing Tank Utilization Assessment (If Applicable)	
Model Characterization	☐ Displacement Hull ☐ Planing Hull ☐ Submersible ☐ Other
Scale Factor (λ) = L_{SHIP} / L_{MODEL}	
Model Length (L_{MODEL}) (FT)	
Model Beam (B_{MODEL}) (FT)	
Model Displacement (Δ_{MODEL}) (LB)	
Maximum Desired Towing Speed ($V_{MODEL,\ MAXIMUM}$) (FT/S) • 120 FT Towing Tank Limit = 13 FT/S • 380 FT Towing Tank (Low-Speed Carriage) Limit = 25 FT/S • 380 FT Towing Tank (High-Speed Carriage) Limit = 32 FT/S • **VERIFY:** Does $V_{MODEL,\ MAXIMUM}$ correlate to a reasonable Froude Number, Reynolds Number, and/or Strouhal Number?	
Blockage Parameter (m) = $A_{X,\ MODEL}$ / A_{TANK} • 120 FT Towing Tank, A_{TANK} = 8 FT (Width) × 5 FT (Depth) = 40 FT^2 • 380 FT Towing Tank, A_{TANK} = 26 FT (Width) × 16 FT (Depth) = 416 FT^2 • **VERIFY:** m ≤ 0.10 (10%)	
Does this experiment require wave-making capability/functionality?	☐ Yes ☐ No
Does this experiment require any modification to existing towing tank conditions (e.g. shallow water)?	☐ Yes ☐ No

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APPENDIX ONE – EXPERIMENT TEST MATRIX & TIME ESTIMATE

Parameter/Variable	Variable Range (Minimum – Maximum)		Number Of Variations
	Model Scale	Full Scale	
e.g. Model Speed (V_{MODEL})	*e.g. 1.00 – 5.00 FT/S*	*e.g. 3.16 – 15.81 FT/S*	*e.g. 5 Total Variations (1 FT/S Speed Increments)*
e.g. Model Depth	*e.g. 1.00 – 3.00 FT*	*e.g. 10.00 – 30.00 FT*	*e.g. 3 Total Variations (1 FT Depth Increments)*
Total Number Of Experimental Runs Review *Number Of Variations* Column → Multiply All Unique Row Values Together (e.g. Total Runs = 5 Variations (Speed) × 3 Variations (Depth) = 15 Total Runs			

Event Description	Number Of Runs	Total Estimated Event Time (HR) • **120 FT TT = 8 MIN/Run** • **380 FT TT (Calm) = 15 MIN/Run** • **380 FT TT (Waves) = 20 MIN/Run**
e.g. Model Resistance, 1.00 FT Depth	*e.g. 5 Total Runs (1 FT/S Speed Increments)*	*e.g. 0.67 HR (5 Runs × 8 MIN/Run = 40 MIN = 0.67 HR)*
Total Experimental Run Time (HR) *Total Estimated Event Time* Column → Add All Row Values Together		
Total Experimental Work Time (Days) Assume: 6 HR/Day Of Functional Towing Tank Test Time		

Major Task	Estimated Student/Faculty Time (HR)	Estimated NAHL Staff Time (HR)
Model Design/Fabrication		
Instrument Setup/Calibration		
Model Ballasting/Rigging/Setup		
Computer Wiring/Setup/Configuration		
Towing Tank/Wave-Maker Setup		
Photography/Videography/Lighting Setup		
Total Experimental Run Time (From Above)		
Equipment Disassembly/Restoration		
Data Processing/Analysis		
Total Time Estimate (HR)		

NOTE: NAHL facility/support time is an incredibly valuable resource! At a commercial hydromechanics laboratory, basic experimentation costs range from $2500/Day (120 FT towing tank equivalent) to over $10,000/Day (380 FT towing tank equivalent). Additionally, average personnel costs here at USNA range from approximately $40/HR (MIDN equivalent) to over $60/HR (for technical staff).

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APPENDIX TWO – EXPERIMENT SCHEDULE

Provide a weekly schedule and/or Gantt chart for the entire duration of the proposed project/program effort. Consider and include all associated tasks (e.g. literature review), providing as much detail as applicable.

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APPENDIX THREE – EXPERIMENT SETUP

Provide a basic sketch/drawing of the proposed experimental setup. Digital drawings/files are highly encouraged and can be e-mailed directly to NAHL.

NOTE: NAHL staff members can provide technical assistance with a variety of computer-aided engineering tools, including Microsoft Excel, MATLAB, MaxSurf, Rhinoceros, and SolidWorks. Such consultation should occur very early in the experimental design/development process!