

Project 3: Ship Resistance and Model Testing

Date issued: November 10, 2004

Date due: November 24, 2004

1. Background

The purpose of this project is to familiarize the student with model testing as a method for predicting ship resistance and powering requirements. Model testing results will be compared to actual full scale resistance data for the USS ARLEIGH BURKE DDG51 class guided missile destroyer.

2. Method

Each student will be assigned a lab period at the Ocean Engineering Tow Tank Facility, where a series of calm water runs will be conducted using a 100:1 scale model of the DDG51 without a sonar dome.

3. Data

Use the following values for the characteristics of the full scale DDG51:

L_{PP}	466.0 ft
T	20.69 ft
B	58.98 ft
C_P	0.625
C_X	0.519
C_B	0.519
C_{WP}	0.789
Δ_{SW}	8240 LT
S_{WS}	29,754 ft ²

The following full scale, bare hull, no bow dome data is provided: [**NB**: This is “derived” data from a classified source, but is not classified]

V_s (knots)	10	15	20	25	30
EHP_{BH} (hp)	958	3461	8794	18,873	46,331

4. Assignment

a. Based on the model data collected, tabulate the resistance and effective horsepower at 5 knot increments up to and including 30 knots. Include the experimental data as an appendix to the report. Include at least one full set of calculations.

- b. Submit a plot (or, plots) that show the relationship between:
- R_f and Ship Speed
 - R_R and Ship Speed
 - R_T and Ship Speed
 - Predicted EHP_{BH} and Ship Speed
 - Predicted EHP_{BH} , Full Scale EHP_{BH} , and Ship Speed
- c. Using the above plot(s), discuss your results. Address significant differences between predicted and actual (provided) values and identify possible sources of experimental error.
- d. Write-up. Treat the project write-up as a lab report. Include an introduction and a narrative of what actually was done during the testing and data reduction. Plots should be well referenced in your discussions. Students will be working in groups to obtain experimental data, but the full scale predictions and analyses of results must be an individual effort.