The Wave Resistance of a Model ACV

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Introduction

The purpose of the present note is to compare predictions of the calm-water wave resistance of a small model hovercraft with the experiments of Everest and Hogben [1]. All calculations were made using the program `Flotilla`.

Results

Environmental Variables

	Value
$g\ (ms^{-2})$	9.80665
Water (15° C)	
$\rho\ (kg/m^3)$	999.0
$h_\infty\ (m)$	7.411
$h_{fin}\ (m)$	0.445

Table 1: Principal environmental variables.

Table 1 shows the principal environmental variables used to produce the results to follow. Gravitational acceleration is denoted by g; ρ is the density of water.

	Values
D (m^3)	0.008334
L (m)	2.070
B (m)	1.372

Table 2: Principal dimensions and parameters of the model ACV.

The principal dimensions of the model are given in Table 2. The displacement volume is D, its waterline length is L and beam B.

The top plot of Figure 1 shows the wave resistance coefficient in infinitely deep water as a function of length-based Froude number, $Fr = U\sqrt{gL}$, where U is the ship speed.

The wave resistance coefficient C_W is given by

$$C_W = \frac{R_W \rho g}{p_0^2 B} \tag{1}$$

where the R_W is the wave resistance and p_0 is the mean cushion pressure.

Comparisons with experiments are, on the whole, quite reasonable with the largest errors occurring near the resistance hump at $Fr \approx 0.6$.

The bottom plot of Figure 1 shows C_W in water of depth $h = 0.445m$ (so that $h/L = 0.215$). The agreement with experiment is not as good as for infinite depth water, however there is a lot of scatter in the experimental data.

References

[1] Everest, J.T. and Hogben, N., "Research on hovercraft over calm water", *Trans. RINA*, 1967, pp. 311–326.

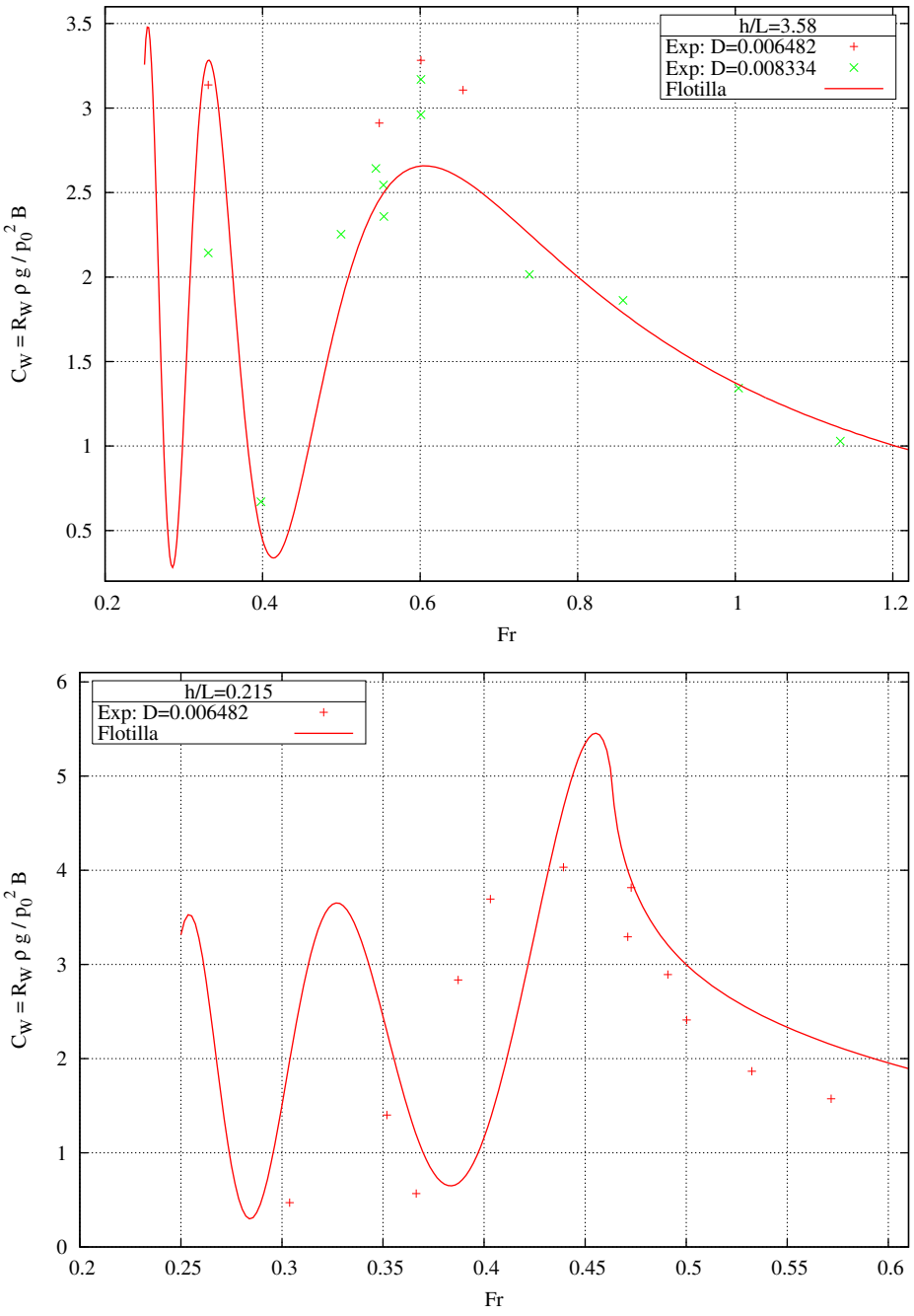

Figure 1: Wave resistance coefficients in deep water (top) and finite depth (bottom).