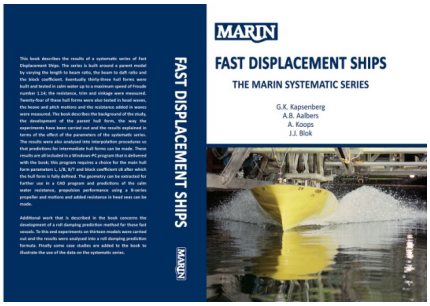
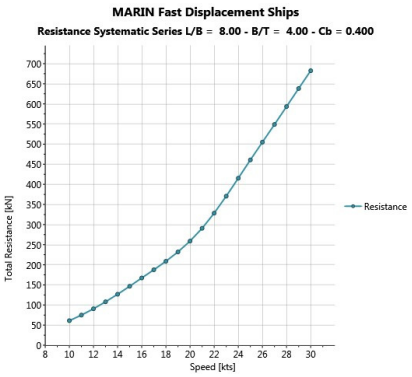
Fast Displacement Ships (FDS)

The MARIN Fast Displacement Ships (FDS) Systematic Series consists of 33 models that have been tested in calm water, 24 models of these were also tested in head seas, 5 models were tested in beam seas and the roll damping was measured of 13 models. The systematic series is built around a Parent Hull Form (PHF), models were derived from this PHF varying L/B, B/T and the block coefficient c_B.
The experiments were carried out in the years 1979 – 1989 as a joint project between the Royal Netherlands Navy, US Navy, Royal Australian Navy, while Delft University of Technology was also involved in the project. Some twenty years after closing the project, the confidentiality of the results has been released by the original partners. A new project was started to secure the knowledge gained by writing a book and to make all results accessible with a modern computer tool. The key researchers of the original project combined their extensive experience with retrospective insight to make this book and the PC program a state-of-the-art contribution to the maritime community.



The Book

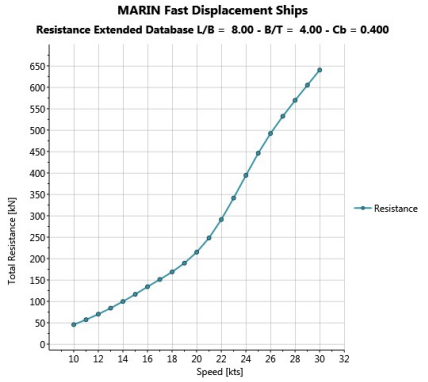
The book describes in detail the background, the methodologies and the analysis of the measurements carried out on all hull forms of the Systematic Series and on nine additional hull forms that are formally not part of the Systematic Series. The book not only condenses the 61 reports that were issued in the course of the project, but also contains some new analysis reflecting the growing insight into the hydrodynamics of these fast displacement ships. The work done on motions in beam seas and measurement of the roll damping at speed is only presented in the book, not in the PC program. A chapter is also added to show some examples of how the data can be used in early design and concept evaluation.

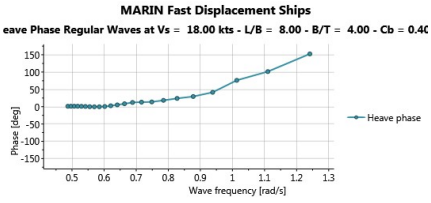


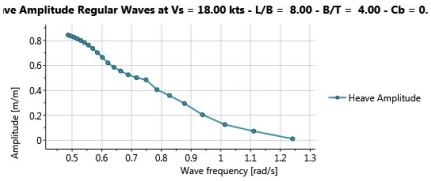
The PC program

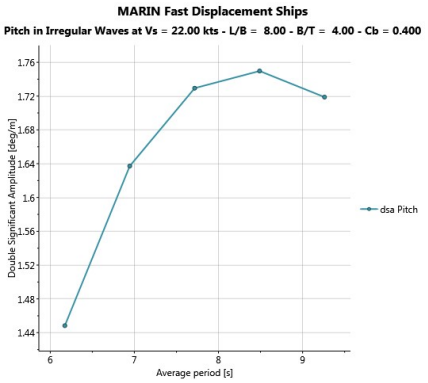
General

The computer program has been written for a PC using a Windows operating system. The main purpose of this program is to make the geometry of the hull forms and all experimental data available to interested people. This data is made even more useful by adding the results of the analysis work; this allows interpolation in hull forms and interpolation in the independent parameters of the series.









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Prediction of the calm water resistance using the Systematic Series

A hull form can be defined using just four parameters: L, L/B, B/T and block coefficient c_B. Calm water resistance is calculated for the naked hull; appendages and the effect of wind resistance and hull roughness can also be included. A propulsion estimate can be made using the polynomials of the Wageningen B-series propellers and an optimum propeller can be found for a given range of diameter, rpm and P/D ratio.
Transom stern wedges can be added to the hull and their effect on trim, sinkage and resistance can be assessed.

Prediction of the calm water resistance for a general fast displacement vessel

Separate prediction formulas have been developed based on results from other systematic series and of general fast displacement vessels that were available in the MARIN database. This method requires a more detailed input than the method using only the FDS hull forms, but is applicable to a wider range of hull forms.

Prediction of motions and added resistance in regular head waves

Motions and added resistance in regular head waves can only be determined for hull forms belonging to this Systematic Series. The program only contains the regression formulas developed from the experimental data obtained in this project; it does not contain a strip theory program.

Prediction of motions and added resistance in irregular seas

Significant values of the heave and pitch motion and the mean added resistance can be calculated for an irregular sea. The method is again limited to hull forms belonging to this Systematic Series.

Hydrostatics and geometry

The parent hull form and the derivatives of this hull form for block coefficients 0.35, 0.45, 0.50 and 0.55 are stored in the program. Using these, simple linear variations and interpolations for intermediate c_B values can be made. When the length of the vessel is chosen, all dimensions are known; hydrostatics are always calculated and stored to file. The hull form is defined in a 3D IGES format suitable for CAD systems and in 2D IDF format suitable for, for instance, strip theory calculations.

Experimental data

The experimental data section is subdivided into the data related to the calm water resistance, trim and sinkage and the data related to the experiments in regular waves. There is a list of all models tested, and selecting one of those simply returns all the experimental results in the calm water or the seakeeping section. The graphs showing this data also contain drawn lines from the regression equations. In this way one has an idea of the accuracy of this analysis.