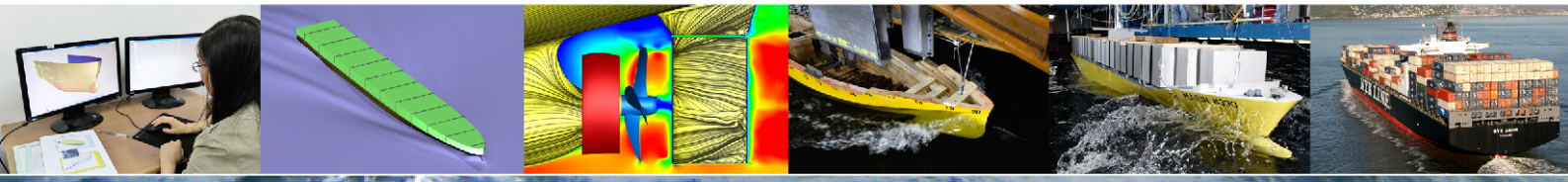
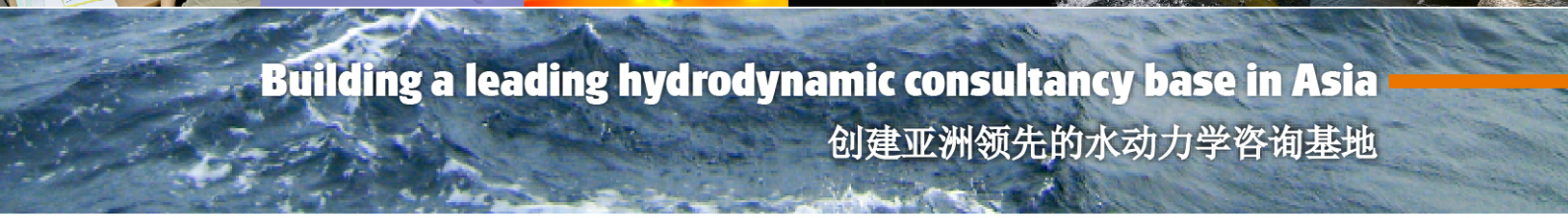


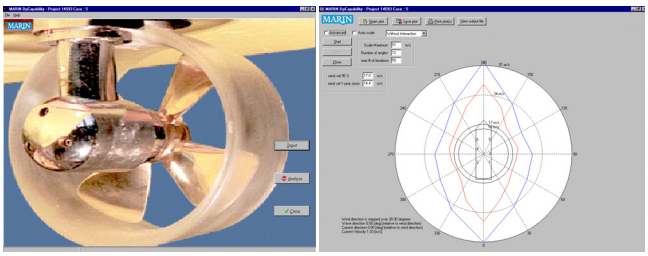


Analysis of thruster capacity in dynamic positioning 动力定位过程中侧推器性能分析

DPCAP

Dynamic Positioning (DP) is coming more and more in use. Therefore, it is desirable to know a system's capacity in an early design stage. To be able to do so MARIN developed the software program DPCAP, which generates so-called DP Capability plots. In these plots, the maximum sea state is shown at which a vessel can operate.

动力定位在应用中越来越频繁。因此，设计初期有必要评估动力定位系统的性能。为了实现这项技术，**MARIN** 研发了 **DPCAP** 软件程序，可以绘制出所谓的动力定位性能曲线。在这些曲线中可显示出一艘船所能适应的最恶劣海况。



Computational approach 计算方法

The program calculates the wind, wave and current forces on several hull types, available from its database. As an additional option, the program is capable of dealing with user supplied coefficients for wind, wave and current forces. The ship can be extended by up to ten superstructure blocks, which can be chosen from nine different elementary forms. The wind loads on the superstructure elements are then computed, using a building block approach. In this approach also shielding effects are taken into account. External forces due to a mooring system or 'dredging' forces can be included as well.

该程序可以从其数据库中获取数据来计算作用在多个船体上的风、浪和流。一个额外选项就是程序能够处理用户自定义的风、浪、流作用力系数。在程序中一艘船可以增加多达 **10** 个上层建筑模块，而且可以选择 **9** 种不同的基本元素形式。使用上层建筑模块后，作用在上层建筑上的风载荷便可计算。在这种计算方法中也考虑了屏蔽效应。还包括由于系泊系统或疏浚时产生的额外作用力。

Since wave forces are largely determined by the wave period, the program uses the relation between the wind speed, the wave height and the mean wave period. This relation can be modified by the user to simulate different locations on earth. To remain on position, the total environmental and external forces on the system must be generated by the available thrusters. Therefore, the total required thrust is distributed over the available thrusters, using a non-linear constrained quadratic optimisation algorithm.

因为波浪力的大小在很大程度上取决于波浪周期，因此该程序考虑的是风速、浪高和平均周期之间的关系。这种关系可以由用户进行修改以仿真作用在固定坐标系中不同的位置。为了保持位置不动，作用在系统上的额外作用力的合力必须与可用的侧推器产生的力相等。因此，通过使用采用非线性约束二次优化算法将所需的总的推力分解在可用的推进器上。

A special feature of the program is the thruster-hull-current interaction and rudder-main propeller interaction. These corrections are based on theoretically and empirically derived coefficients.

该程序的特别之处在于综合考虑了侧推器-船体-流之间的相互作用以及舵-主桨之间的相互作用。这些修正是基于理论和经验推导出的系数。

Application 应用

The program has been developed with a fully interactive user interface and operates on the Windows 95/98 as well as on the Windows NT platform. It is incorporated into the standard software tools at MARIN. In the nearby future extensions will be made to incorporate the effect of

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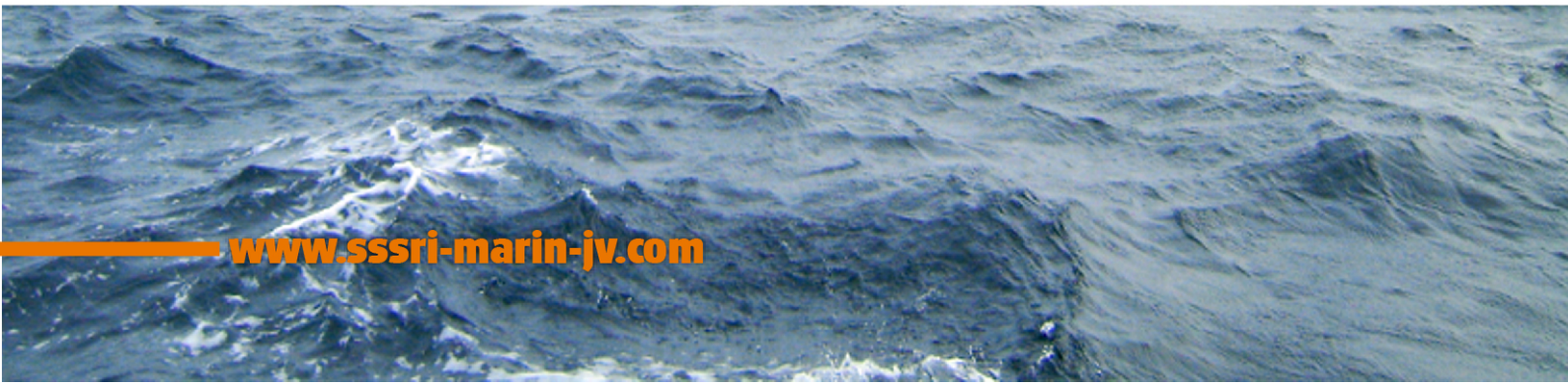

low frequency motions as well as bow tunnel ventilation effects, which occur in higher sea states.

该程序已经研发了一个完全互动的用户界面，同时可在 Windows 95/98 以及 Windows NT 平台上进行操作。该程序已经嵌入到 MARIN 标准软件工具当中。在未来的扩展功能中将涉入低频运动的影响以及发生在高海况情况下的艏侧推孔通风效应。

The program was developed in a Joint Industry Project, with the following participants: Dockwise, Smit Engineering, Holland Roer Propellers, Damen Shipyards, Breeman Engineering and Services, IHC Gusto / IHC van de Giessen - De Noord and MARIN.

该程序属于联合开发工业项目，参研单位包括：Dockwise, Smit Engineering, Holland Roer Propellers, Damen Shipyards, Breeman Engineering and Services, IHC Gusto / IHC van de Giessen - De Noord and MARIN.

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