

Appendix. Table I: Ship parameters

Description	Parameter	Vaule
Ship length	$L_{ship}$	103.63m
Vertical length	$V_{ship}$	82.8m
Ship breadth	$B_{ship}$	19.2m
Ship draft	$H$	6m
Ship mass	$m$	6362.2t
Propeller diameter	$D_r$	5m
Number of propeller blades	$Z$	5
Thrust deduction coefficient	$t_d$	0.2
Rigid body mass matrix and the added matrix	$M + M_A$	Eq.(1)
Hydrodynamic damping matrix	$D$	Eq.(2)

$$M + M_A = \begin{bmatrix} 6.818 \times 10^6 & 0 & 0 \\ 0 & 7.878 \times 10^6 & -2.596 \times 10^6 \\ 0 & -2.596 \times 10^6 & 3.57 \times 10^9 \end{bmatrix} \quad (1)$$

$$D = \begin{bmatrix} 2.649 \times 10^5 & 0 & 0 \\ 0 & 8.816 \times 10^5 & 0 \\ 0 & 0 & 3.377 \times 10^8 \end{bmatrix} \quad (2)$$

Appendix. Table II: Propeller parameters

Thruster	X(m)	Y(m)	Angle(rad)	Maximum Thrust(KN)
Propeller 1	39.5	0	$\pi/2$	125
Propeller 2	35.3	0	$\alpha_2$	150
Propeller 3	31.3	0	$\alpha_3$	150
Propeller 4	-28.5	5	$\alpha_4$	320
Propeller 5	-28.5	-5	$\alpha_5$	320