PREDICTION OF MANOEUVERING BEHAVIOUR OF A RESEARCH VESSEL (RV) DISCOVERY USING SIMULATION PROGRAM

NURUL ISLAH MOHAMMAD

FACULTY OF MARITIME STUDIES AND
MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU

2012

bpd
LP 38 FMSM 2 2012

PREDICTION OF MANOEUVRING BEHAVIOUR OF A
RESEARCH VESSEL (RV) DISCOVERY USING
SIMULATION PROGRAM

By

Nurul Islah Binti Mohammad

Research Report submitted in partial fulfillment of
the requirement for the degree of
Bachelor of Applied Science (Maritime Technology)

Department of Maritime Technology
Faculty of Maritime Studies and Marine Science
UNIVERSITI MALAYSIA TERENGGANU
2012

DEPARTMENT OF MARITIME TECHNOLOGY

FACULTY OF MARITIME STUDIES AND MARINE SCIENCE

UNIVERSITI MALAYSIA TERENGGANU

DECLARATION AND VERIFICATION REPORT

FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled:

PREDICTION OF MANOEUVRING BEHAVIOUR OF A RESEARCH VESSEL (RV) DISCOVERY USING SIMULATION PROGRAMME

by **NURUL ISLAH BINTI MOHAMMAD**, Matric No. **UK 18357** have been examined and all errors identified have been corrected. This report is submitted to the Department of Maritime Techonolgy as partial fulfillment towards obtaining the Degree of Applied Science (Maritime Technology), Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

Verified by:

....

Principal Supervisor

Name: Mr.Che Wan Mohd Noor B. Che Wan Othman

Official stamp:
CHE WAN MOHD NOOR
PENSYARAH
JABATAN TEKNOLOGI MARITIM
FAKULTI PENGAJIAN MARITIM DAN SAINS MARIN
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

Date: 21/6/12

....

Second Supervisor

Name: Dr.Ahmad Faisal B. Mohd Ayob

Official stamp:
DR. AHMAD FAISAL MOHAMAD AYOB
LECTURER
DEPARTMENT OF MARITIME TECHNOLOGY
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

Date: 8/7/2012

....

Head of Department of Maritime Technology

Name: Dr. Mohamad Fadhli B. Ahmad

Official stamp:
ASSOC.PROF. DR. MOHAMMAD FADHLI AHMAD
HEAD
DEPARTMENT OF MARITIME TECHNOLOGY
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

Date: 21/6/12

i

DECLARATION

I hereby declare that this thesis entitled Prediction of Manoeuvring Behaviour of A Research Vessel (RV) Discovery Using Simulation Programme is the result of my own research except as cited in the references.

Signature : *[signature]*

Name : NURUL ISLAH BINTI MOHAMMAD

Matrix No : UK18357

Date : 21 / 6 /2012

ACKNOWLEDGEMENT

PREDICTION OF MANOEUVRING BEHAVIOUR OF A RESEARCH VESSEL (RV) DISCOVERY USING SIMULATION PROGRAMME

ABSTRACT

Good manoeuvring ability of a vessel is important and critical to ensure successful operations. In order to improve the vessel's design, knowledge on an early prediction method is crucial for a ship designer. There are many test methods available for manoeuvring prediction such as free running model test and captive model tests. However these methods are expensive and time consuming. As an alternative, the approach proposed in this thesis incorporates a numerical simulation method with parameters derived from a database. This paper presents the manoeuvring prediction of a Research Vessel (RV) Discovery which includes the development of time domain simulation program using Matlab Simulink software. Three degrees of freedom were considered that are surge, sway, and yaw and which later apply the Newtonian laws, the equations of motion were framed. Further, forces on hull, forces and moments induced by propeller and rudder were also taken into consideration. Later, the simulation results obtained are compared with full-scale sea trial results. Based on the current findings, it can be concluded that the derived formulation can be used as a reliable and economic tool at the early design of such vessel.

RAMALAN TERHADAP KEUPAYAAN GERAK KAPAL "RV DISCOVERY" MENGGUNAKAN KAEDAH SIMULASI

ABSTRAK

Keupayaan untuk mengendalikan keupayaan sesebuah kapal adalah penting dan kritikal untuk memastikan sesebuah kapal itu beroperasi dengan berjaya. Pengetahuan untuk membuat ramalan awal adalah penting bagi pereka kapal untuk meningkatkan reka bentuk kapal. Terdapat beberapa kaedah yang boleh digunakan seperti ujian model bebas, ujian model tertawan dan sebagainya, tetapi kebanyakannya melibatkan kos yang tinggi dan masa yang panjang. Kaedah simulasi berangka digunakan di dalam kajian ini dimana parameter ditentukan daripada pangkalan data telah menjadi alternatif kepada kaedah yang sedia ada. Kajian ini memaparkan kajian ramalan olahgerak ke atas kapal "RV Discovery" yang mana melibatkan program simulasi. Tiga darjah pergerakan bebas kapal yang akan dipertimbangkan dalam kajian ini adalah pergerakan ke hadapan, pergerakan dari kiri ke kanan, dan pergolengan kapal dimana pergerakan-pergerakan ini akan digunakan dalam undang-undang *Newtons*. Selanjutnya, daya-daya di badan kapal, daya dan detik yang dicetuskan oleh kipas kapal dan kemudi juga dipertimbangkan dalam kajian ini. Kemudian, keputusan simulasi yang diperoleh akan dibandingkan dengan keputusan-keputusan ujian penuh kapal di laut. Berdasarkan penemuan-penemuan semasa, dapat disimpulkan bahawa penerbitan rumus boleh digunakan sebagai satu cara yang boleh dipercayai dan ekonomi di peringkat awal rekabentuk kapal.