

COMPUTER AIDED DESIGN AND ANALYSIS OF REMOTELY  
OPERATED VEHICLE FOR SHALLOW WATER OPERATION

LOO WAI LIAM

bpd  
LP  
14  
FMSM  
1  
2013

SCHOOL OF MARITIME STUDIES AND SCIENCE MARINE  
UNIVERSITY MALAYSIA TERENGGANU

2013

ju: 8442

1100087901



opu  
LP 14 FMSM 1 2013  


1100087901  
Computer aided design and analysis of remotely operated vehic  
for shallow water operation / Loo Wai Liam.

PERPUSTAKAAN SULTANAH NUR ZAHIRAH  
UNIVERSITI MALAYSIA TERENGGANU (UMT)  
21000 KUALA TERENGGANU

1100087901		

Lihat sebelah

HAK MILIK  
PERPUSTAKAAN SULTANAH NUR ZAHIRAH UMT

COMPUTER AIDED DESIGN AND ANALYSIS OF REMOTELY  
OPERATED VEHICLE FOR SHALLOW WATER OPERATION

By

Loo Wai Liam

A Thesis submitted in partial fulfillment of  
the requirements for the degree of  
Bachelor of Applied Science (Maritime Technology)

DEPARTMENT OF MARITIME TECHNOLOGY  
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE  
UNIVERSITI MALAYSIA TERENGGANU



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:  
**COMPUTER AIDED DESIGN AND ANALYSIS OF REMOTELY OPERATED  
VEHICLE FOR SHALLOW OPERATION** by **LOO WAI LIAM**, Matric No. **UK  
20460** has been examined and all errors identified have been corrected. This report is  
submitted to the Department of Maritime Technology as partial fulfillment towards  
obtaining the Degree **APPLIED SCIENCE (MARITIME TECHNOLOGY)**,  
Faculty of Maritime Studies and Marine Science, University Malaysia Terengganu.

Verified by:

Principal Supervisor

Name: Dr. Ahmad Faisal bin 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: 10/1/2013

Head of Department of Maritime Technology

Name: Prof. Madya Dr. Mohammad Fadhli bin 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: 10/1/13

## DECLARATION

I hereby declare that this thesis entitled Computer Aided Design and Analysis of Remotely Operated Vehicle for Shallow Water Operation is the result of my own research except as cited in the references.

Signature :   
Name : Loo Wai Liam  
Matric No. : UK 20460  
Date : 10/1/2013

## ACKNOWLEDGEMENTS

I would like to express my deep and sincere gratitude to my supervisor, Dr. Ahmad Faisal bin Ayob for his guidance, encouragement, assistance, suggestions, support and dedication throughout this project. I have been amazingly fortunate to have a supervisor who gave me the freedom to express my idea and at the same time gave me the guidance to recover when my steps faltered. Thanks for his valuable feedback and suggestion to improve this project. I wish to express my sincere appreciation to all the team members that worked together with me in the Final Year Project team, namely the Dr. Ahmad Faisal's FYP Team – ROBOTRON. Those team members are Suen Jin Young, Lim Guowei, Ahmad Amirudin, Hairul Asyraf, Ainun Naemah, Norhayati binti Abdul Khalid, Intan Nur Shafinas, Faiq Fawwaz, Akmal Nawawi as well as Khairee Ibrahim who provided greatest support in this project. I would like to extend my warmest thanks to my friends who gave me support and encouragement for completing this dissertation. Last but not least, my special gratitude and deepest appreciation goes to my beloved family for their motivation, encouragement, care and support during completing this research paper.

## COMPUTER AIDED DESIGN AND ANALYSIS OF REMOTELY OPERATED VEHICLE FOR SHALLOW OPERATION

### ABSTRACT

Remotely Operated Vehicle (ROVs) for underwater research have been under study and developed over the past few years. It is an important exploration tool especially for underwater research. As these researches have improved from time to time, it also increases the depth of underwater research exploration. Due to environment hazardous to human ability in which at high depth that pressurized divers and bring difficulty for the underwater tasks, ROVs are somehow important and needed to be improved to meets the required performance. Therefore, the objective of this project is to design and develop a micro-class remotely operated vehicle for shallow water operation mainly used for academic purposes. This paper discussed about the different designs of micro class ROV and its CFD analysis for shallow water operation. Five candidate designs of ROV with different specification and shapes are proposed for the design stage. All the designs of ROVs are needed to be analysed the performance in terms of its coefficient of drag and stability. Data are collected based on the drag coefficient and stability values calculated from formulas. The best design is selected after some data comparison generated from these two analyses. The selection criteria of the design are based on the lowest value on coefficient of drag and higher value of stability data. Some recommendation and suggestion were also made so that it can be applied in order to redesign a better and much more futuristic design of ROV for the underwater vehicle development.

## **REKA BENTUK BANTUAN KOMPUTER DAN ANALISIS BAGI “REMOTELY OPERATED VEHICLES” (ROVs) DI KAWASAN AIR CETEK**

### **ABSTRAK**

“Remotely operated underwater vehicles” (ROVs) untuk penyelidikan dalam air telah dikaji dan dibangunkan sejak beberapa tahun yang lalu. Ia merupakan salah satu alat penerokaan yang penting terutama bagi penyelidikan dalam air. Apabila penyelidikan ini telah bertambah baik dari semasa ke semasa, ia juga meningkatkan kedalaman penerokaan penyelidikan dalam air. Oleh disebabkan persekitaran yang berbahaya terhadap keupayaan manusia di mana pada kedalaman yang tinggi penyelam mengalami tekanan tinggi dan membawa kesukaran untuk menjalani tugas dalam air, pada masa inilah ROV memainkan peranan penting dan dengan sebab tersebut, ia perlu diperbaiki untuk memenuhi prestasi yang diperlukan dari semasa ke semasa. Oleh yang demikian, objektif projek ini adalah untuk merekabentuk dan membangunkan mikro-kelas ROV yang mampu beroperasi pada kawasan air cetek terutamanya digunakan untuk tujuan akademik. Kertas kerja ini membincangkan tentang reka bentuk bagi mikro-kelas ROV yang berbeza serta analisis CFD bagi setiap ROV yang beroperasi dalam air cetek. Lima bentuk calon ROV dengan spesifikasi dan bentuk yang berbeza telah dicadangkan semasa peringkat reka bentuk. Kelima-lima ROV yang telah direkabentuk perlu menjalani prestasi analisis dari segi pekali seretan dan kestabilannya. Data yang dikumpul adalah berdasarkan nilai pekali seretan dan kestabilan yang dikira dari formula. Reka bentuk ROV yang terbaik dipilih selepas beberapa perbandingan data dijalankan daripada kedua-dua analisis iaitu analisis berdasarkan pekali seretan dan kestabilan ROV. Kriteria pemilihan reka bentuk ROV yang terbaik adalah berdasarkan nilai terendah pada pekali seretan serta nilai yang lebih tinggi data kestabilan ROV tersebut. Beberapa ulasan dan cadangan juga telah dibuat supaya ia boleh digunakan untuk mereka bentuk semula ROV yang lebih baik dan lebih futuristik untuk pembangunan kenderaan dalam air pada masa akan datang.