Southampton Solent University

Faculty of Technology

BEng (Hons) Mechanical Design

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Project Feasibility, Specification and Gantt chart

"Design and modelling of a tender-launching device for a 40 meter-leisure boat."

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This report is submitted in partial fulfilment of the requirements of Southampton Solent University for the degree of BEng (Hons) Mechanical Design.

Contents:

1 – Project feasibility report 3
1.1 – Background and introduction 3
1.2 – Literature survey 3
1.3 – Options discussions 4
1.4 – Resources implications 5
1.5 – Recommendations 6

2 – References and Bibliography 7
2.1 – Regulations 7
2.2 – Referencing the leisure boat design 7
2.3 – Textbooks and printed resources 7
2.4 – Web resources 8

3 – Appendix A: Specifications 9
3.1 – Technical specifications 10
3.2 – Commercial specifications 10
3.3 – Environmental specifications 10
3.4 – Acceptance specifications 11

4 – Appendix B: Gantt chart 12
4.1 – A3 Gantt chart 13

Notation:

DFA: Design for Assembly
DoF: Degree(s) of Freedom
GT: Gross Tonne
IMO: International Maritime Organization
MCA: Maritime and Coastguard Agency
PTC: Parametric Technology Corporation ®

1 - Project Feasibility Report

1.1 – Background and Introduction

Despite being the final project of a BEng degree course, this work is not based on any outline required by a company (due to a proper customer/ market demand) or advised by the University teaching staff.

This project consists of the whole *design process of a launching device for a 6 meter-tender boat on and off a 40 meter-luxury boat*. All the specifications neither due to safety rules nor to technical boards are being supplied by the leisure boat designer.

And the leisure boat *preliminary design* is objective of the final project written by Giacomo Michelini Tocci, BEng Yacht and Powercraft Design at Southampton Solent University Faculty of Technology in the A. Y. 2007/08 [2].

The main task in the project consists of collecting the technical data[1] available period by period and modelling the mechanical device consequently.
The *problem* this project aims to solve is how to best equip a leisure boat with a tender launching tool respecting safety and technical constraints and fitting as much the boat design requirements.

At this early stage in the project the *best* technical choices, among the ones developed in the forthcoming months, will be those fitting into the smallest modification to the leisure boat which is independently designed and assuring good flexibility together with the smallest dimensions, weight and waste of power.

1.2 – Literature Survey

The project in its different stages will be assisted by a wide range of different nature sources and resources. All of those already collected are listed in the bibliography -section **2-** and for this reason a brief explanation of their individual role and applications follows.

[1] Positioning sites, areas and volumes available on the boat, affordable values of loads and weights, constraints due to design choices, etc.

- The **MCA code** listed as [1] includes all boards the project must obey and, in case of necessity, references further specifical regulations dealing with particular design conditions or other

- The **BEng final project** by Giacomo Michelini Tocci ([2]) will supply all requirements, data and constraints necessary to give a shape to the related launching system

- The **mechanics textbooks**, listed as [3] to [6], will provide the necessary theoretical support during the design calculations and structural analysis of the components to be produced

- Being written resources as well, **magazines** as [7] and [8] will provide a list of further internet sources (manufacturers and companies websites) and an excellent source of pictures of models already available on the market

- Not less important, thanks to a largest range of applications, **websites** may supply photos folders (mainly [9] and [11] to [14]), technical ([11] to [13]) and commercial and miscellaneous ([14]) information and features of inherent 100-180 ft power yachts, proper tender boats manufactures ([10]), ship equipments ([16]) or vessels mechanics related topics ([15]).

1.3 – Options Discussion

The launching system will equip a yacht with roughly maximum length in the range of 40-45 meters, maximum width 8-10 m and mass of about 200 GT when operative and will provide the movements of a 6 m-tender boat, whose weight is estimated as 1 GT plus personnel aboard, as specified in **3.4**.

To get efficiency in such a task an analysis of materials and geometries will be carried on, with particular attention to the loading conditions and balance of the device itself and of the whole mechanical system yacht + launching device + tender.

Depending on the specifications and constraints being supplied in weeks 8 on, and depending if the device will be installed in the stern

area or in any other site within the leisure boat, the best technical solution will be chosen among the following.

- Device placed on the deck (permanently in the open air) or into an inner site or room

- Device involving a front/ rear or side door or not any door on the hull (on any of the yacht walls)

- Device based on:
  - a crane system
  - one or more rails system
  - a telescopic translating arm or an elastically bending arm
  - a ropes system

- Device with 2 (probably the minimum value) or more DoF

- Device with only translation or translation + rotation DoF/ actuators

- Metal based main structure or relevant employment of other materials

- Fully or partially automated device.

1.4 – Resource Implications

Objective of this project is to design a tender boat launching device fitting the disposed spaces into the leisure boat, obeying all factors of safety and regulation concerning the maritime and yacht environment.
After the end of the feasibility stage, all precise data and constraints will be collected in order to go thru the dimensioning and positioning stage.
Further than the printed and web sources referenced, the employment of **Auto Cad** printouts is being necessary to evaluate overall views of the yacht and building sites on it, while the device modelling will be aided, in the latest design phase (ref.: Gantt Chart), by using **PTC ProEngineer Wildfire 2.0** software pack.

1.5 – Recommendations

This project aims to design a machine whose task is already field of study for a large number of companies.
In order to look forward a result respecting all the regulations and being competitive with a large market concurrency, the main subjects faced will be the following.

- Complete collection of
    - **leisure boat design specifications**, data and printouts, [2]
    - **technical constraints boards** (IMO, MCA [1])

- **Critical analysis of both the sets of data above**, in order to specify
    - positioning site on the vessel
    - a number of design solutions and a first rough range of geometrical and dynamical dimensions for the device

- **Internet and technical magazines research**, in order to achieve the most complete overview on existing models and design solutions

- **Choice of the best design solution** among the ones worked out

- Proper design stage, involving stress analysis based **structural design**, inherent **choice of the building materials** and consequent **software aided modelling**.

2 – References and Bibliography

2.1 - Regulations

[1] Maritime and Coastguard Agency, *The Large Commercial Yacht Code*, edition 2, Southampton (UK), September 2007, sections 1, 2, 3, 4, (8A), 11, 24.

2.2 – Referencing the leisure boat design

[2] Giacomo Michelini Tocci, BEng Yacht and Powercraft Design final project *Preliminary design of 40 meter leisure boat* (provisional title), Southampton Solent University – Faculty of technology, Sep. 2007/ Jun 2008.

2.3 – Textbooks and printed resources

[3] F. P. Beer, E. R. Johnston jr., *Vector mechanics for engineers* – **Statics**, 2nd SI Metric Edition, McGraw-Hill, Singapore, 1999, ISBN 0-07-100454-8.

[4] F. P. Beer, E. R. Johnston jr., *Vector mechanics for engineers* – **Dynamics**, 2nd SI Metric Edition, McGraw-Hill, Singapore, 1999, ISBN 0-07-100455-6.

[5] J. M. Gere, S. P. Timoshenko, *Mechanics of Materials*, 4th SI edition, Stanley-Thornes Ltd. Cheltenham (UK), 1999, ISBN 0-7487-3998-X.

[6] R. C. Hibbeler, *Mechanics of Materials*, 7th edition, Pearson Prentice Hall, ed. 2008, ISBN 978-0-13-220991-5.

[7] *Boat International*, monthly number 257, November 2007, Edisea Ltd., Kingston upon Thames, Surrey (UK).

[8] *The Naval Architect*, International Journal of The Royal Institute of Naval Architects, issue October 2007, RINA London (UK).

2.4 – Web resources

[9] www.boatinternational.com

[10] www.castoldijet.it

[11] www.trinityyachts.com

[12] www.abeking.com

[13] www.ycoyacht.com

[14] www.ancasta.com

[15] www.ghsport.com

[16] www.sec-bremen.de

Appendix A: SPECIFICATIONS

3 – Specifications

3.1 – Technical specifications

- Critical evaluation of the technical solutions chosen by other manufacturers in the field and of the features of the models already available on the market

- Best employment and application of existing technologies (cranes, rails, ropes systems, etc.) depending on the specifications from the leisure boat design

- To involve the smallest modification possible on any of the leisure boat components

- To result as the best compromise between performance/ flexibility and employment of areas, volumes, weight, power/ energy

- To stand bendings and all mechanical actions, obeying the necessary factors of safety

- Despite the necessity of satisfying a large range of constraints, to employ the smallest number of actuators (DoF), according to DFA concepts

3.2 – Commercial specifications

- To be competitive with the market average in performance, endurance, maintenance

- The cost of materials, manufacturing and installation must justify the choice of such a plant to equip the yacht

3.3 – Environmental specifications

- To avoid failure due to galvanic corrosion by employing the same material for those hull and device components which are

in contact, including bolts and joints. Different materials may be employed together only if electrically compatible

- To require the minimum human work for the device to be operated

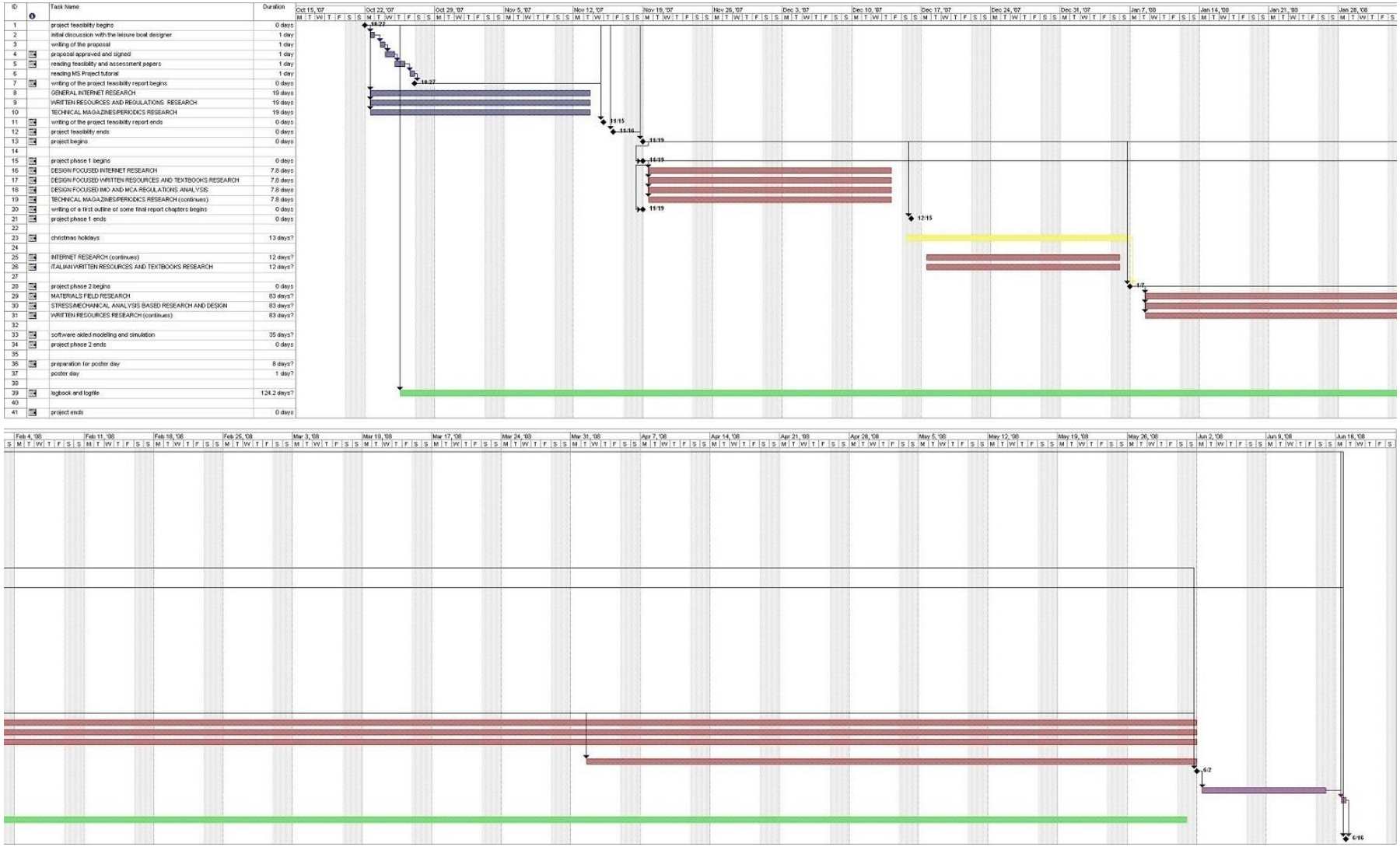
- To make the device suitable for installation on other vessels, as well as the one it was designed for, thanks to its overall design and performance

3.4 – Acceptance specifications

- To achieve safety and versatility features for the device to operate with or without personnel aboard the tender (usually 1 person only), ***not*** in lifesaving circumstances

- To fit the general requirements by IMO and MCA LY2 [1], as much as the leisure boat project and the tender boat project

Appendix B: GANTT CHART



ID	Task Name	Duration
1	project feasibility begins	0 days
2	initial discussion with the leisure boat designer	1 day
3	writing of the proposal	1 day
4	proposal approved and signed	1 day
5	reading feasibility and assessment papers	1 day
6	reading MS Project tutorial	1 day
7	writing of the project feasibility report begins	0 days
8	GENERAL INTERNET RESEARCH	19 days
9	WRITTEN RESOURCES AND REGULATIONS RESEARCH	19 days
10	TECHNICAL MAGAZINES/PERIODICS RESEARCH	19 days
11	writing of the project feasibility report ends	0 days
12	project feasibility ends	0 days
13	project begins	0 days
14		
15	project phase 1 begins	0 days
16	DESIGN FOCUSED INTERNET RESEARCH	7.8 days
17	DESIGN FOCUSED WRITTEN RESOURCES AND TEXTBOOKS RESEARCH	7.8 days
18	DESIGN FOCUSED IMO AND MCA REGULATIONS ANALYSIS	7.8 days
19	TECHNICAL MAGAZINES/PERIODICS RESEARCH (continues)	7.8 days
20	writing of a first outline of some final report chapters begins	0 days
21	project phase 1 ends	0 days
22		
23	christmas holidays	13 days?
24		
25	INTERNET RESEARCH (continues)	12 days?
26	ITALIAN WRITTEN RESOURCES AND TEXTBOOKS RESEARCH	12 days?
27		
28	project phase 2 begins	0 days
29	MATERIALS FIELD RESEARCH	83 days?
30	STRESS/MECHANICAL ANALYSIS BASED RESEARCH AND DESIGN	83 days?
31	WRITTEN RESOURCES RESEARCH (continues)	83 days?
32		
33	software aided modelling and simulation	35 days?
34	project phase 2 ends	0 days
35		
36	preparation for poster day	8 days?
37	poster day	1 day?
38		
39	logbook and logfile	124.2 days?
40		
41	project ends	0 days