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TOWARDS THE PROSPERITY OF ARCHIPELAGIC COUNTRIES

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TABLE OF CONTENTS

Preface vi
Committee vii

SESSION IA : Marine Basic Design
1. Theoretical, Numerical And Experimental Investigation Into Ship Wave Wash Characteristics. I K A P Utama, P A Dewanda’ and I G A R Sutawijaya 1
2. Experimental Work: Wave Interaction And A Concrete Breakwater With A Pile Supported Harbour Moh. Ridwan Utina and Andi Jamaluddin 11
3. A Numerical Model Of Hydrodynamics In The Vicinity Of Hemispherical Artificial Reefs Haryo Dwito Armono 23
4. Drag Coefficient of Wave Force on APO Sabaruddin, Radianta Triatmadja, and Bambang Triatmodjo 33

SESSION IIA : Marine Basic Design
1. Study And Analysis Of Damping Coefficients On Floating Barge Abdul Ghofur, Arifin, and Endang Widjiati 43
3. Experimental Study On The Instability Of FPU Barge In Damage Condition Arifin, Moh. Ridwan Utina 67
4. Seakeeping Evaluation Of A Semi-Swath Design Adi Maimun, Omar Yaakob, Ahmad F. 79

SESSION IIIA : Marine Management
1. The Influence of Water Depth Into Ship Performance in Terms of Side-Force Murdijanto and I Ketut Aria Pria Utama 95
2. Experimental Study On Deck Wetness Of FPU In Random Seas Baharuddin Ali, Abdul Ghofur, Samudro 101
3. A Preliminary Study On Electricity Generation By Tidal Current In Alas Strait Erwandi, Rina, Afian Kasharjanto, Irfan Eko Sanjaya, Zulis Irawanto 109

SESSION IVA : Marine Basic Design
1. Performance of Ship Model With Semielliptical Section, Nozzle-Like Side Strips at Hydrodynamics Laboratory M. Hasbullah, M. A. Djabbar, Juswan, S. Hariyanto, S. Baso, Saiful 119
2. A Method for Predicting the Added Resistance and Selecting Main Engine Propulsion Plant for a Motor Ship Service in Inter-island Trade in Indonesia
Sea (Restricted Water)
Yusuf Siahaya and M. Syuaib Nur
3. Problems on Replacing The Stabilizer Of West Sulawesi Traditional Boat Of Sandeq By Hydrofoils
M.A Djabbar, Lukman Bochary and Syamsul Asri
4. Reliability Ultimate Strength Floating Storage Offloading (FSO) Analysis By Simulation Monte Carlo
Vivian Karim Ladesi, Eko Budi Djamiko

SESSION VA : MARINE MANAGEMENT

1. Regional Integration Of Maritime Education And Research As A Means For Upgrading The Maritime Industries
Khabirul Haque Chowdhury

157

2. Observation On The Freeboard And Stability Of Second Hand Car & Passenger Ferries Sank In Indonesian Water
Teguh Sastrodiwongso
Naufal Bahriscy, Sudjarwoko

171

3. The Design of Shipboard Incenerator Occupied the Waste Heat Recovery of Main Engines to Fulfill the Regulation 16 of Annex VI Marpol 73/78.
Agoes Santoso, Soemartojo W.A, Edi Pramono

183

4. The Competitive Advantage Of Indonesia Major General Seaports
Saut Gurning

199

SESSION I B : MARINE APPLICATION

1. An Analysis Of Passenger Vessel Accidents In The Inland Waterways Of Bangladesh
Zobair Ibn Awal, Dr. M. Rafiqul Islam and Md. Mazharul Hoque

211

2. Retrieving Ship Accommodation Deck Layout Designs Using A Combined Spatial And Numerical Pattern Matching Technique
I G. N. Sumanta Buana, Djauhar Manfaat And Trice Kusuma Dewi

221

3. The Role of Traditional Ships in Sea Transportation in Southern Sulawesi
Ganding Sitepu

235

SESSION II B : MARINE APPLICATION

1. Introducing Boats Of The Pabbiring Islands: Transformation, Typology And Technological Adaptations
Aziz Salam, Wihdat Djafar, Katsuya Osozawa

241

2. Traditional Wooden Shipbuilding In Bonerate Island
Baharuddin Abidin, Wihdat Djafar, Azis Salam

253

3. Study on the Construction Strength of Phinisi Boat
Syahrir Husain

259

SESSION III B : MARINE APPLICATION

1. Investigation On The Optimal Sizes Of Abaca Fiber Reinforced Concrete Boat
Sunaryo

269

2. An Investigation Into The Use Of Catamaran Form As Dredging Vessel
I Putu Sindhu Asmara
I Ketut Aria Pria Utama

275

3. Radarsat-1 SAR For 3-D Mapping Of Coastal Water Front
Maged Marghani and Mazlan Hashim

281
### SESSION IV B : MARINE APPLICATION

1. Experimental Investigation On The Abaca Fiber Reinforced Concrete As Boat Building Material  
   Sunaryo  
   291
2. The Use of A Machine Learning Technique In Generating A Hierarchy Of Ship Design Concepts  
   Djauhar Manfaat  
   297
3. Active Damage Detection Of An Offshore Structural Component Using Pairs Of PZT Sensor-Actuator  
   Wibowo H.N, Sahlan R.B  
   309
4. Application Of Solar Energy On West Sulawesi Traditional Boat Of Sandeq  
   Nadjamuddin Harun, M.A. Djabbar, Eko Haryono  
   321

### SESSION V B : MARINE APPLICATION

1. Spray-Strake Effect On Manoeuvring Performance Of A Planing Hull  
   Adi Maimun, Omar Yaakob, A. Haris Muhammad, Agoes Priyanto  
   325
2. Load Out Study Of Offshore Jacket Structure  
   Taufiqur Rachman, Aldino Syahrurn  
   337
3. The Influence Of Electric Current And Welding Position On The Mechanical Characteristic Of SMAW Welded Ship Plate  
   Sunarto, M. R. Firmansyah, Suandar Baso  
   353
4. Effect Of Sea Water On Compressive Strength Of Portland Pozzolan Cement Mortar  
   M. Wihardi Tjaronge, Abd. Madjid Akkas  
   361
5. Controlling Nonholonomic Mobile Robots Using Neurointerface System  
   Rafiuddin Syam, Mansyur Hasbullah, Nasaruddin Salam, Keigo Watanabe  
   367
PREFACE

On behalf of the Organizing Committee, I would like to welcome and thank all authors, presenters and participants of the Fifth Marine Technology Conference 2006 (MARTEC V-2006). The Organizing Committee of MARTEC V compiled all accepted papers into a conference proceeding to ensure its continuity to be one of the sources of reference in the maritime technology field. Besides it, the organizing compiled also a number of late submitted accepted papers into supplement to conference proceeding.

The MARTEC 2006 Proceeding consists of 40 papers that divided into 10 sessions of presentation, 3 subtopics: Marine Basic Sciences; Marine Application; and Marine Management. The arrangement of presentation session and topics of paper presented is not always in line due the any difficulties of the sequencing.

In out-laying of proceeding format, the Organizing Committee just adjusted some minor spelling and paper format ignoring the contents originality and validity of the paper. As a non-referee conference, the content of paper stays fully as responsibility of its author(s).

The Organizing Committee made all efforts to ensure the quality of the proceeding. Nevertheless, please accept our apologies for some mistakes and misprints that disturbing reader of this proceeding.

Finally, on behalf of the Organizing Committee, I would like to take this opportunity to express our thanks and appreciation to the authors, presenters, sponsors, participants, and all parties who had contributed to the success of this conference. We do hope that MARTEC 2006 Proceeding will be a valuable source of reference in Marine technology field and will encourage more research works and study for empowering maritime industries towards the prosperity of archipelagic countries.

Makassar, September 2006

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Andi Muliama
ANALYSIS OF PASSENGER VESSEL ACCIDENTS IN THE INLAND WATERWAYS OF BANGLADESH

Zobair Ibn Awal¹, M. Rafiqul Islam², Mazharul Hoque³

¹Jr. Research Fellow/Lecturer, Accident Research Centre (ARC)
Bangladesh University of Engineering & Technology (BUET), Dhaka 1000
E-mail: ibnawal@arc.buet.ac.bd

²Associate Professor, Department of Naval Architecture & Marine Engineering
Bangladesh University of Engineering & Technology (BUET), Dhaka 1000
E-mail: rafiqis@name.buet.ac.bd

³Professor & Head, Department of Civil Engineering and
Director, Accident Research Centre (ARC)
Bangladesh University of Engineering & Technology (BUET), Dhaka 1000
E-mail: dirarc@arc.buet.ac.bd

Abstract

This study investigates the characteristics of passenger vessel accidents in the inland waterways of Bangladesh and attempts to identify some of the underlying causes. This study is limited to the accidents passenger vessels which occurred in the inland waters during 1995-2005. A total of 67 cases were considered in this study and the data were collected from Department of Shipping (DOS), Ministry of Shipping (MOS), Bangladesh. Total number of human casualties were more than 1500 (one thousand and five hundred) during this period. The statistical study revealed that the leading causes of accidents were found to be collision due to human error (56%) and loss of stability due to Nor’weaster (21%) (Nor’weaster is a type of storm locally known as ‘Kalboishakhi’) which particularly occurs in the monsoon in Bangladesh. The study also identifies some other causes of accidents such as loss of stability due to rushing of passenger, overloading, grounding, etc. However, all these accidents were broadly categorised in two groups: 1) Accidents involving human errors and 2) Accidents due to natural disasters. It was observed that over 75% of these accidents fall into the earlier group and the rest falls into the later category. Analysis of the length of the vessels suggests that vessels having length in the cohort of 40-60 meter fell more into accidents (about 44%). It is also noticed that accidents were occurring all around the clock leaving behind no particular patterns to trace out. Geographical Information System (GIS) has been used to identify the most hazardous locations on the basis of frequency of the occurrence. It is pertinent to mention that the data collected and analysed in this study may not represent the total safety situation in Bangladesh as many accidents in the country not often get reported or remain underreported due to less exposure to the media probably because the victims represent the poorer segment of the society.

Indeed, the time has come to modernise and redesign the inland water transport sector of Bangladesh since a safe transportation system has the potential to relieve enormous burden on other modes of transport with the ability to render a balanced multimodal and cost-effective sustainable transport system for both mass movement of passengers and goods in Bangladesh. Nevertheless, based on this study a number of recommendations are made for further research and investigations.

Keywords : Accident, Passenger Vessel, Inland Water Transport (IWT), Statistical Analysis
1. INTRODUCTION

The inland water transport system in Bangladesh is both extensive and well-connected with the rest of the transport system. In terms of traffic intensity, the inland waterway network generates about 1.57 million passenger-kilometres per route-kilometre of waterway. The density of inland ports and terminals is much higher on the inland waterways with approximately 3.7 berthing facilities per 100 route-kilometres. The density of passenger facilities on the inland waterways is also high at around 40 per 100 route-km [1].

Mostly of passenger vessels, cargo vessels, tankers, tugboats and dumb crafts ply in the inland waterways of Bangladesh. In the year 2000, the number of registered passenger vessels (including sea trucks and ferries) was 1,868, cargo vessels (including tanker and coaster) 2,160, dumb craft 760 and towing vessel 194. The static carrying capacity of the IWT fleet is about 0.20 million passengers and 0.55 million tons cargo. In terms of carrying capacity, the private sector outweighs the contribution of the public sector both for the passenger and cargo movement (private sector 93% for passenger and 95% for cargo). In the informal sector, the country boats plying mainly in the perennial waterways play the key part. According to Bangladesh Bureau of Statistics (1991-1992), the number of country boats operating within the country was 745,000, a substantial part of which has already been mechanised mostly with low-cost shallow pump engines. Approximately 65% of the country boats are passenger boats and the rest are cargo boats. The static cargo capacity of the country boats is about one million tons, nearly double that of the formal IWT sector [1, 2].

Some recent studies suggest that with the increase in population in the country the waterways are getting very congested. Consequently, the number of accidents in the waterways are also uprising and causing serious socio-economic problems. Investigations show that over eight thousand people have died, injured and been reported missing due to these accidents in the past few years. This caused a great concern in both local as well as international community and has become a national issue [3, 4].

2. DATA COLLECTION AND DATABASE DEVELOPMENT

One of the primary goals of this study is to compile and maintain a technical database which will work as a tool for in depth accident analysis and research and that will help to come up with pragmatic recommendations and solutions in order to prevent such disasters. The accident data were collected from the reports of Department of Shipping (DOS). These reports stores accident data essentially for legal purpose and give more emphasis on the parameters related legal issues. Therefore extraction of scientific data, which are absolutely crucial for accident analysis, from these reports is very much cumbersome and time consuming.

A separate spreadsheet database hence been developed consisting of 19 different parameters. These parameters are then grouped in to 6 major categories. Figure 1 shows the database structure elaborately.
3. CAUSES ANALYSIS OF ACCIDENTS

3.1 Types of Accident Causes
Five major types of accidents have been identified in this study, such as Collision due to human errors, Loss of stability due to Nor’wester and overloading, Stability problems due to rush of passenger and overloading, Grounding & Others. Table 1 shows the distribution of accident causes against different months of the year and Figure 2 shows their respective percentages.
### Table 1: Distribution of accident causes against months

<table>
<thead>
<tr>
<th>Months</th>
<th>Accident Causes</th>
<th>Collision due to human error</th>
<th>Loss of stability due to Nor’weaster and overloading</th>
<th>Stability problems due to rush of passenger and overloading</th>
<th>Grounding</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td></td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>6</td>
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<tr>
<td>February</td>
<td></td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>March</td>
<td></td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>April</td>
<td></td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>May</td>
<td></td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>June</td>
<td></td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>July</td>
<td></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>August</td>
<td></td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>September</td>
<td></td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>October</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>November</td>
<td></td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>December</td>
<td></td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>37</td>
<td>14</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>67</td>
</tr>
</tbody>
</table>
3.2 Types of Vessels
Analysis of the length of the vessels suggests that vessels having length in the cohort of 40-60 meter fell more into accidents (about 44%) as shown in Figure 3. Vessels of this length range are the most common and popular type of transport for travelling in the inland waters of the country and usually used for medium to long range trips. The next most vulnerable group of vessels appeared to be of below 20 meter length (27% of all accidents). These types of vessels are usually used in the rural areas for short and medium trips for a limited range.

Figure 2: Percentage of different types of accidents.

Figure 3: Percentage of accidents according to vessel length.
Analysis on registration type suggests that vessels registered as MV (Motor Vessel) face more accidents (over 50%) than any other groups. Motor Launch (ML), Motor Trawler (MT), Public Service (PS) vessels, Ferry and other type of vessels contribute the rest of the accidents as shown in Table 2. An important to be mentioned here is that the country boats (another vulnerable type of vessel) are not included in this accident study since most of these vessels are not registered with the Department of Shipping (DOS).

Table 2: Year against vessel type.

<table>
<thead>
<tr>
<th>Year\Vessel Type</th>
<th>MV</th>
<th>ML</th>
<th>MT</th>
<th>PS</th>
<th>Ferry</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
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<td>3</td>
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<td>0</td>
<td>5</td>
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<tr>
<td>1996</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>1997</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>1998</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>1999</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>2000</td>
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<td>16</td>
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<td>0</td>
<td>0</td>
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<td>8</td>
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<tr>
<td>2002</td>
<td>3</td>
<td>1</td>
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<td>0</td>
<td>0</td>
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<td>6</td>
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<td>2003</td>
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<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>2004</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>2005</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>55</td>
<td>17</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>16</td>
<td>102</td>
</tr>
</tbody>
</table>

3.3 Accident Time
The analysis of accident time suggests that accidents occur all around the clock. This is because the predominant accident type is collision and this type of accidents fundamentally doesn’t depend on weather condition and thus on time of the day. However, figure 4 suggests that there is a slightly higher tendency of accidents occurring during the afternoon period. This is because most of the nor’weaster appears 1200 to 1800 hrs suggested by experience.
3.4 Accident Locations

The analysis of accident locations (Figure 5) using Geographical Information System (GIS) clearly suggest that the southern part of Bangladesh are the most hazardous locations and the water way along the river Meghna appears the route to be concerned with. Many accidents have also taken place within the waterways of Dhaka and Narayangang district.

**Figure 4:** Accidents time.

**Figure 5:** Accident locations shown using GIS (includes both passenger and cargo vessel).
4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Research Findings
The research findings of this study may be summarised in the following manner:

- The predominant causes of accidents for passenger vessels in the inland waterways of Bangladesh are Collision and Nor’weaster (77%) out of which collision due to human error alone stands 56% of all accidents.
- The general observation is that accidents take place more during the monsoon season but this is considered as a total safety scenario. However, this study suggests that vessels carrying passengers meet accidents all around the year.
- Vessels having length in the cohort of 40-60 meter fell more into accidents (about 44%) than any other groups.
- The average number of accidents per year in 9.273 with a standard deviation 3.23. The minimum number of accidents per year is 5 and the maximum number of accidents per year is 16.

4.2 Recommendations
Considering the importance of water transportation system in the context of Bangladesh, necessary actions should be taken immediately in order to reduce the number of these tragic events. This will save a lot of lives and relieve the nation off a huge quantity of economic losses. Recommendations for improvement of waterway safety situation on the basis of this study can be summarized as:

- Collision type of accidents can be reduced by avoiding foggy weather condition and ensuring searchlight in functioning condition. Also the working environment for masters and drivers has to be improved in terms of ergonomics so that they don’t get fatigue and/or get reluctant about their responsibility.
- Weather forecasting system has to be improved to reduce cyclone type of accidents. In addition, enforcements may be enhanced to guard against plying in a bad weather condition.
- Availability of adequate amount of life saving equipments should be ensured. Crews should be trained in this regard and public awareness should also be increased.
- More in depth analysis of these accidents are required in order to come up with pragmatic solutions.

REFERENCES