Coast Guard Fishing Vessel Safety Committee, research and development session, December 2, 2002

Molyneux, W. D.

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National Research Council Canada
Conseil national de recherches Canada
Institute for Ocean Technology
Institut des technologies océaniques

Technical Report

TR-2002-20

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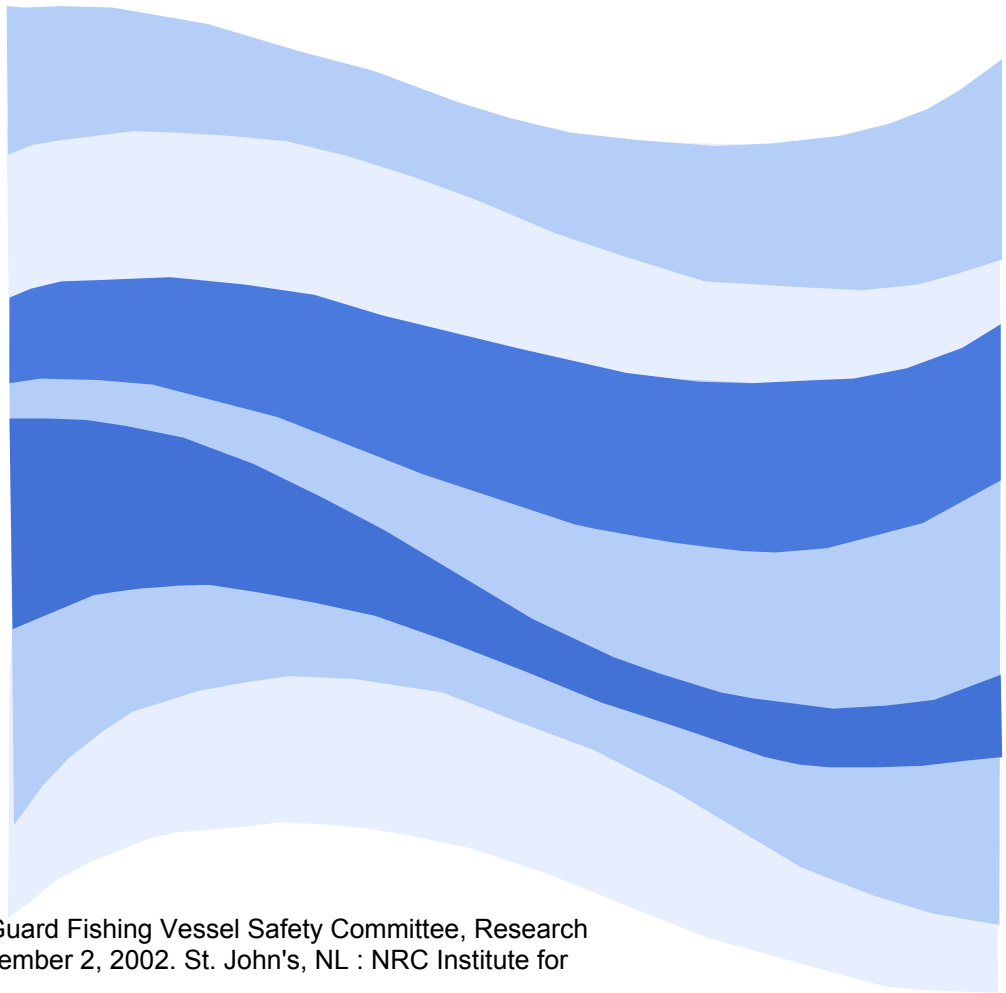
W. D. Molyneux

December 2002



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Canada

National Research Council Canada
Conseil national de recherches Canada

Institute for Marine Dynamics
Institut de dynamique marine

COAST GUARD FISHING VESSEL SAFETY COMMITTEE, RESEARCH AND DEVELOPMENT SESSION, DECEMBER 02, 2002

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TITLE

COAST GUARD FISHING VESSEL SAFETY COMMITTEE, RESEARCH AND DEVELOPMENT SESSION, DECEMBER 2ND, 2002

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SUMMARY

This report summarizes a series of presentations on research relevant to fishing boat safety. The presentations were made to Canadian Coast Guard's Fishing Vessel Safety Committee by researchers from IMD, MUN, C-CORE and a new company, Cathexis. It makes recommendations for further research, based on the committee's requirements.

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TR-2002-20

COAST GUARD FISHING VESSEL SAFETY COMMITTEE
RESEARCH AND DEVELOPMENT SESSION
DECEMBER 2ND, 2002
AIRPORT PLAZA HOTEL, ST. JOHN'S, NEWFOUNDLAND

INTRODUCTION

The Fishing Vessel Safety Committee was formed after the publication of a report by Canadian Coast Guard, (Reference 1). The report highlighted the disturbing trend of an increase in search and rescue incidents involving fishing vessels under 65 ft length. The Fishing Vessel Safety Committee has been focusing on developing programs to train fishers in the proper safety procedures. However, the Committee Co-Chair felt that it would be worthwhile to have the committee members briefed on ongoing research in areas relevant to fishing vessel safety.

The Committee approached David Molyneux, a Researcher at NRC's Institute for Marine Dynamics, to organize and facilitate a session, drawing in people from the Newfoundland community with experience relevant to fishing vessel safety. The meeting was scheduled for December 2. This report provides a summary of the meeting.

The list of people attending is given in *Table 1*. The people who made presentations to the committee are listed in *Table 2*.

PRESENTATIONS ON RESEARCH AND DEVELOPMENT RELATED TO FISHING VESSEL SAFETY

The format of the meeting was for short presentations followed by discussion related to that presentation. After all the presentations had been made there was further discussion on consolidated topics. This discussion is summarized in the next section.

Key points on each of the presentations are summarized below. Copies of the slides used for the presentations are given in *Appendix 1*.

IMD's Safety Research Program

- IMD provides the host for a database on offshore-related safety material
- The links between research, simulation and training are critical
- Research plays a role in evaluation and certification of safety equipment

Fishing Vessel Safety and Related Research & Consulting

- Bulbous bows can reduce pitch motions, making the ship safer
- Anti-roll tanks can reduce roll motions, making the ship safer
- Speed is a safety issue since shorter weather windows can be used
- Vessel designs are growing in peculiar directions due to regulatory constraints
- Unconventional hull shapes (catamaran) are becoming accepted
- Vessel safety should be factored in to vessel replacement rules
- Vessel safety should be factored into vessel modifications
- Small vessels get little attention from professional designers, but are biggest risk

Personal Emergency Locator Tag for Inshore Fishery

- Personal locator tag can be an effective safety device for one or two man crews
- Must be affordable (<$200)
- Must be capable of alerting SAR services
- Must fit on person with minimum of disturbance to normal work
- Details of working frequency and tracking device still to be worked out

Occupational Safety Onboard Fishing Vessels

- Include attention to human performance in initial design considerations
- Motion induced interrupts, motion sickness and body stability all considered
- Aim to detune ship from environmental conditions (natural periods)
- Effective strategies for lowering motions are
  - Speed and heading to waves
  - Location of task within ship
  - Increase vessel size to reduce motions
- Need data on real human performance during fishing against measured numbers
- Link measurements to operational limits

Safecatch-A Community Research Alliance on Fishing Health and Safety

- Safecatch is project that focuses on fishing safety, with community involvement throughout the life of project
- Collect data on accidents and near misses into linked database
  - 1989-present
  - Trusted third party to collate and store data
  - Data at depth for research and raising new questions
- Comparison of regulatory regimes for fishing
- Returning injured fishers to work after accidents

- Designing safer fishing vessels
- Plan for creation of center focusing on workplace health and safety research for Atlantic Canada

Application of Wireless Asset Management Systems to Fishing Vessel Safety

- Cheap and effective short-range system for tracking location of crew
- Can be used onboard ships of all sizes
- Locator stays with the ship, tag goes on person
- Can be linked to vessel's emergency distress system

Motions and Safety of Fishing Vessels

- Ultimate stability (capsize) has been heavily researched
- Definition of extreme motions not well defined for fishing vessel
- Consider motion induced interrupts, motion induced fatigue and motion induced sickness
- Use damping devices to make roll more comfortable
  - Bilge keels
  - Bilge fins
  - Paravanes
  - Anti-rolling tanks
- Damping devices for pitch
  - Bulbous bow
  - Beaver tail
- Anti-roll tanks must be tuned to static and dynamic stability of each ship

DISCUSSION ON FUTURE RESEARCH REQUIREMENTS

There were six themes that moderators observed coming through in the course of the discussion, which will have an influence on future Research & Development related to Fishing Vessel Safety. The moderator identified these as follow:

1. Relevant Data Bases
2. Impact of Regulations & Constraints
3. Development of Protocols and Certifications
4. Engineering
5. Training and Delivery of Research Results
6. Community Input to Future Research

The discussion on each of these items is summarized below.

1. Relevant Data Bases

Management decisions must be based on accurate data. Within the fishing industry, many different groups collect data, but it is not linked together. A database that contains:

a. Accident information
b. Weather and environmental factors
c. Level of crew training
d. Vessel data
e. Type of fishing
f. Policies

In a way that information can be extracted, in particular long term trends or effects of changes in regulation, will be very valuable. The Safecatch project will be a good start to data base creation, and will be able to identify what must be collected for the next generation of database.

2. Impact of Regulations and Constraints

There are a wide variety of policies and resulting regulations effecting fishing vessels, which include the control of total fishing effort (within and across species), the safety of the ship, the fishing vessel as a workplace, and the fishing vessel as a ship. Often the regulations are inappropriate as developments have changed what were thought to be practical upper limits, for example the growing size of vessels under 65 ft puts them over 500 GRT. Also vessels are modified with differing degrees of skill and knowledge throughout their lifetimes. Regulations take time to develop and are often responsive to immediate needs, so do not factor in possible long-term developments.

Also the degree of enforcement of regulations was discussed. The trend is towards voluntary compliance rather than mandatory. This requires different approaches from both the industry and regulators than for a mandatory inspection scheme.

There was a great deal of discussion on this topic and other policy issues were discussed, such as the links between vessel replacement strategies and community development. If resource allocations are pooled then, it favours more industrial applications, whereas individual quotas may favour smaller independent enterprises. These approaches can have a big impact on the economy of small, rural communities.

One thing that is clearly missing is a simulation tool that enables the changes in these parameters to be effectively evaluated, prior to making the changes in policy.

3. Development of Protocols and Certifications

In contrast to the previous topic, there was very little comment on this theme. Safetynet was evaluating work gloves for fishing boat operations, but no other topics were suggested.

4. Engineering

Engineering was sub-divided into three sub-categories. These were

- Vessel design
- Modeling and simulation
- Product Development

Friis's presentation was an example of a naval architect working with the fishing community to improve operational efficiency. The result was changes to the hull form, which reduced fuel consumption and vessel motions. Alternative hull forms were also developed (catamaran). All of the work was done for large-scale fisheries.

It was felt by committee members, that there was very little attention paid to small boat design and construction standards. Whilst small boats may not withstand capsize in all sea conditions, there is no real reason for a vessel and crew to sink and nobody know what has happened. Guidelines or standards for small boat construction would be worthwhile. Other guidelines that would be useful were guidelines on vessel modification, when modifications are often done with little engineering. This should include studies on the relevance of new materials for vessel construction.

Simoes-Re, Akinturk and Bass focused on modeling and simulation. Newfoundland has a superior capability in this area and it is logical for researchers to work with industry in developing models and simulations for ship or safety equipment behaviour. This is important information for regulators, operators and trainers in providing standards and procedures for the operation of equipment. This research should tie in with regulators' policies.

Power and Taylor emphasized that safety can be a business, and new product ideas can add value to a community. It is logical that products are inspired by the needs of the local economy, but clearly there is a worldwide market for this equipment. It is hoped that other equipment can be developed and tested using links between industry and researchers and the result will be the development of practical, affordable and high quality products.

5. Training and Delivery of Research Results

Newfoundland leads the country in its ability to bring together all players in a particular industry. This can be capitalized on, and the Safecatch model provides a good basis for expanding information exchange to other areas. Researchers tend to find a solution, and then go out and look for a problem to which to apply it. Industry sees the problem first. Constructive dialogue can bring the two groups together in such a way that everyone wins. However, the community should be aware of academic requirements and time scales.

It is important to have community involvement in planning, execution and delivery of research results, as well as both sides receiving feedback on the outcomes. Topics must be presented at the correct level. Whilst it is for researchers to present results to their peers, it is more important for the community that research results get acted upon in a timely and profitable manner.

6. Community Input to Future Research

The impact of training programs needs to be assessed. We must ask if the courses provide the right material, if does the participant retain it effectively, and when does it need to be refreshed or renewed?

The need for introductory training of fishing crews before they gain work experience must be studied. Typically someone will go to sea with no training, and only qualify for support for course when they have some sea time. This is the opposite of other industries (e.g. mechanics) who can obtain certification before starting work.

A measure of success of the fishing vessel safety committee would be to obtain courses related to the fishery (safety, work practices, economics, biology etc.) in the Province's High Schools.

Delivery and feedback mechanisms must be placed within the communities, through established groups (schools, unions, churches etc.).

CONCLUSIONS

This was the first time that the Fishing Vessel Safety Committee had met with researchers. Whilst many members of the committee were aware in general terms of the topics and levels of effort, it was a useful opportunity for the two groups to meet and discuss matters of mutual interest.

In terms of directions, it seems that the most promising areas for future cooperation can be:

1) *Development of relevant databases*

2) *Develop simulation models for evaluating the effect of changes in the fishery, which includes the effects of:*
   - *Biology*
   - *Environment*
   - *Fishing technology*
   - *Vessel design*
   - *Economics*

3) *Provide guidelines on small boat construction and operation*

4) Provide guidelines on best practices for vessel modification

5) Provide researchers with access to fishing operations to provide correlation between measured vessel motions and real work task limits.

It is proposed that the Fishing Vessel Safety Committee meet regularly with researchers, to be updated on progress. An annual review would be the most likely interval.

REFERENCES

M. Wiseman and H. Burge, '*Fishing Vessel Safety Review (Less than 65 ft)*', Maritime Search and Rescue Newfoundland Region, Fisheries and Oceans Canada, Coast Guard, November 2000.

Tables

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5	John Porter	Fisherman	786-7541	
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29	Desmond Power	C-CORE	737-8853	des.power@c-core.ca
30	Don Bass	MUN/Ocean & Naval Arch. Engineering	737-8950	dbass@engr.mun.ca

Table 1, List of Attendees

Name	Organization	Topic
Antonio Simoes Re	Institute for Marine Dynamics	IMD's Safety Research Program
Dag Friis	Ocean and Naval Architectural Engineering, MUN	Fishing Vessel Safety and Related Research & Consulting
Des Power	C-CORE	Personal Emergency Locator Tag for Inshore Fishery
Ayhan Akinturk	Institute for Marine Dynamics	Occupational Safety Onboard Fishing Vessels
Stephen Bornstein	NLCAHR/SafetyNet	Safecatch-A Community Research Alliance on Fishing Health and Safety
Steve Taylor	Cathexis	Application of Wireless Asset Management Systems to Fishing Vessel Safety
Don Bass	Ocean and Naval Architectural Engineering, MUN	Motions and Safety of Fishing Vessels

Table 2, Presenters to Fishing Vessel Safety Committee

APPENDIX 1

PRESENTATIONS TO THE FISHING VESSEL SAFETY COMMITTEE

IMD'S SAFETY RESEARCH PROGRAM

by

António Simões Ré
Institute for Marine Dynamics,
National Research Council

SAFETY RESEARCH PROGRAM

António J. Simões Ré
National Research Council Canada
&
Brian Veitch
Memorial University of Newfoundland

Fishing Vessel Safety Committee
Airport Inn, St. John's
2 December 2002

NRC/MUN

SAFETY RESEARCH PROGRAM

Safety projects < 1998

- **USCG-CCG Lifejacket program**
- **Heat Loss from immersion suits**
- **Tests of lifecraft system concepts**
- **Esperanto "OVATEK" certification trials**
- **Liferaft capsizing / Drift**
- **Lifeboat launching comparative study**
- **Offshore/marine studies**
- **FRC/Lifeboat retrieval**

NRC/MUN

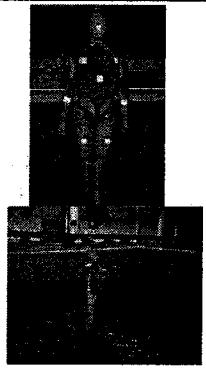
SAFETY RESEARCH PROGRAM

Safety projects > 1998

- **Escape Evacuation and Rescue (EER) research program**
- **Marine Escape Evacuation and Rescue (EER) Resource Centre**
- **FPSO motion sickness study**
- **Survival craft training simulator**
- **Advanced ship evacuation simulation (ASES)**

NRC/MUN

SAFETY RESEARCH PROGRAM < 1998



USCG-CCG Lifejacket program

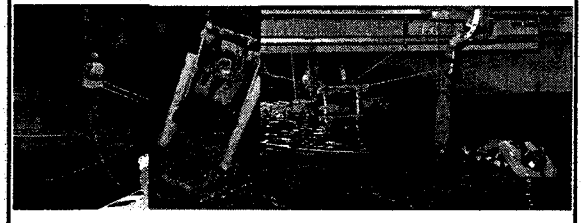
A Sea Water Instrumented Manikin (SWIM) buoyant motions in still water and in waves were evaluated to start the validation of a mathematical model. Both the manikin and the software are intended to evaluate the performance of personal flotation devices (PFD). The motions have been compared to those of humans.

NRC/MUN

SAFETY RESEARCH PROGRAM < 1998

Heat Loss from immersion suits

Collaborative work with the CORD group of Halifax and the Defence Civil Institute for Environment Medicine allowed us to look into thermal characteristics of suits as well as comparative evaluation of lifevests.



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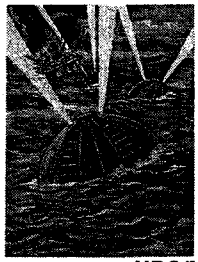
SAFETY RESEARCH PROGRAM < 1998

Tests of lifecraft system concepts
Work on a conceptual lifecraft, gyrosphere. Mainly the work comprised of proof of concept.



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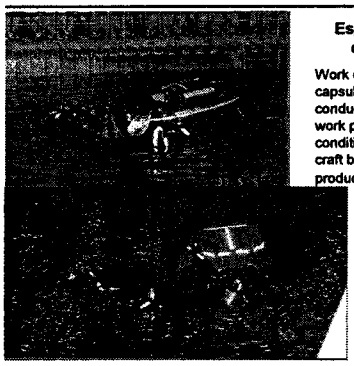
SAFETY RESEARCH PROGRAM < 1998

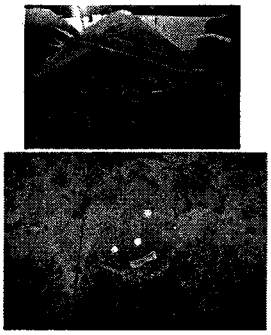


Esperanto "OVATEK" certification trials

Work on a the Esperanto capsule "OVATEK" was conducted at the Institute. The work permitted TC to give initial conditional certification to the craft before it went in production

NRC/MUN

SAFETY RESEARCH PROGRAM < 1998



Liferaft capsizing / Drift

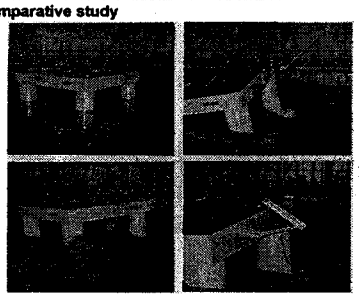
The Institute studied the capsize phenomenon of inflatable liferafts and the development of design and procedure changes that could improve performance and decrease capsizing. Along with this work the Institute collected information on wind and wave loads on inflatable liferafts with special focus on the effectiveness of different sea anchor designs.

NRC/MUN

SAFETY RESEARCH PROGRAM

Lifeboat launching comparative study

Model test experiments on four different types of evacuation systems approved by Transport Canada (Davit, PROD, Seascape and Freefall). The objective was to identify the smoothness of delivery of the lifeboat to the water surface, the ability of the systems to work in different semisubmersible floating conditions, i.e. even keel and damage, and the ability of the lifeboat to move away from the structure.



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SAFETY RESEARCH PROGRAM < 1998

Offshore/marine studies

The study explained the regulatory regime pertaining the evacuation of offshore installations and associated safety issues and identified the legislative and regulatory authorities and their responsibilities.
As part of the study a survey of offshore evacuation systems applicable to fixed and floating structures was conducted.
The systems included those presently approved by Transport Canada, as well as those under development and awaiting approval and those at concept stage.

FRC/Lifeboat retrieval

A mathematical model that represented either the launch or retrieval of a FRC was developed at the Institute. The model can be extended to include aspects of rescue of lifeboats, liferafts and humans.

NRC/MUN

SAFETY RESEARCH PROGRAM > 1998

Preliminary Trials	(1999-2000)
Benchmark I	(2000-2001)
Extreme Weather, Payload, Wave Steepness and Launch control	(2001-2002)
Benchmark II	(2001-2002)
Benchmark III Preliminary Full Scale	(2002-2003)
Floating Platforms	(2003-2004)
Full Scale Verification	(2003- .....)
Fit for Purpose	(2003- .....)

Integrated Research Program Plan

NRC/MUN

SAFETY RESEARCH PROGRAM > 1998

GOALS & APPROACHES

- In circumstances that necessitate a marine evacuation, personnel must have access to an evacuation system, be able to embark & launch safely, clear the installation, and survive until rescued,

.... and to have reasonable expectation of successfully escaping harm in the environmental conditions that can reasonably be expected to prevail during operations

NRC/MUN

SAFETY RESEARCH PROGRAM > 1998

Escape Evacuation and Rescue (EER) research program

The objective of the study is to establish a baseline performance profile of evacuation system performance capability as a function of environmental conditions through a systematic series of model experiments for which a number of basic parameters are varied.

The benefits from conducting this series of experiments are the quantification of evacuation system performance degradation as a function of environmental conditions.

Determination of the effect of evacuation system design variation on system performance and establishment of a non-proprietary database on evacuation system baseline performance that may be used by designers, operators and regulators to make rational decisions.

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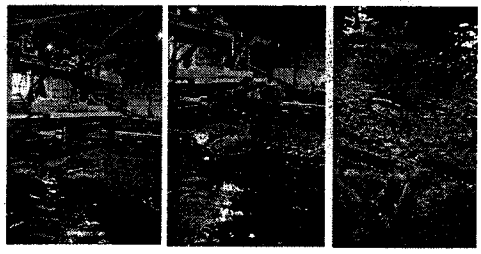
SAFETY RESEARCH PROGRAM > 1998

Preliminary Trials
(1999-2000)

NRC/MUN

SAFETY RESEARCH PROGRAM > 1998

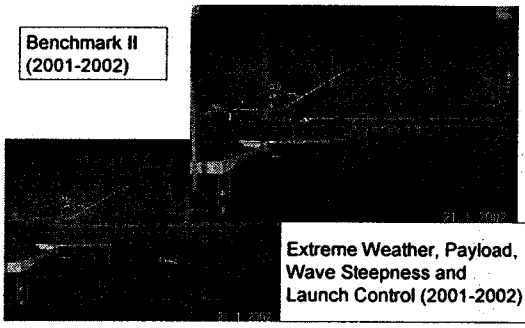
Performance capabilities of evacuation systems in a range of wind and open water waves



NRC/MUN

SAFETY RESEARCH PROGRAM > 1998

Benchmark II
(2001-2002)



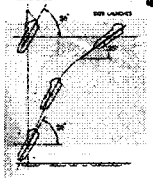
Extreme Weather, Payload, Wave Steepness and Launch Control (2001-2002)

NRC/MUN

SAFETY RESEARCH PROGRAM > 1998

Benchmark III **(2002-2003)**

- Free Fall Evacuation System
  - Lifeboat is allowed to "free fall" to the water.
  - Two Methods of launch
    - Vertical drop
    - Skid launch



NRC/MUN

SAFETY RESEARCH PROGRAM > 1998

Marine Escape Evacuation and Rescue Resource Centre

Establish an Escape, Evacuation and Rescue (EER) Database and information centre.

The benefits expected from establishing the database and information centre the availability of EER information at one physical location (i.e. information centre) and a secure searchable database. The centre includes Web site dedicated to the EER with links to local, national and international databases.

www.nrc.ca/imd/eer

NRC/MUN

SAFETY RESEARCH PROGRAM > 1998

FPSO motion sickness study

Survival craft training simulator

Advanced ship evacuation simulation (ASES)

NRC/MUN

SAFETY RESEARCH PROGRAM > 1998

Funding agencies

- Transport Canada (TC)
- Natural Resources Canada (NRCan)
- Canadian Association of Petroleum Producers (CAPP)
- National Research Council (NRC)

NRC/MUN

FISHING VESSEL SAFETY AND RELATED RESEARCH AND CONSULTING

by

Dag Friis
Ocean and Naval Architectural Engineering
Memorial University

FISHING VESSEL SAFETY RELATED RESEARCH AND CONSULTING

by

Dag A. Friis
Professor of Ocean and Naval Architectural Engineering
Memorial University

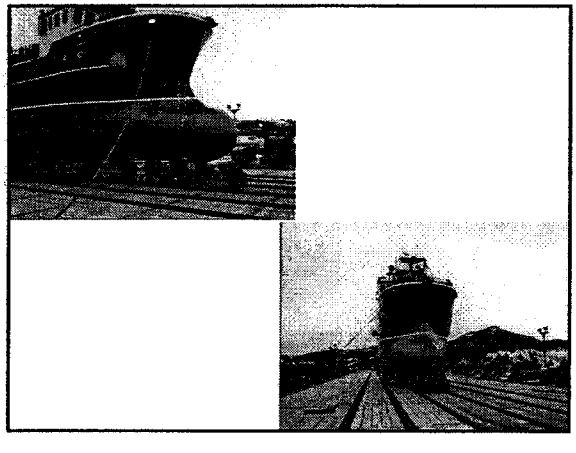
Research Projects:

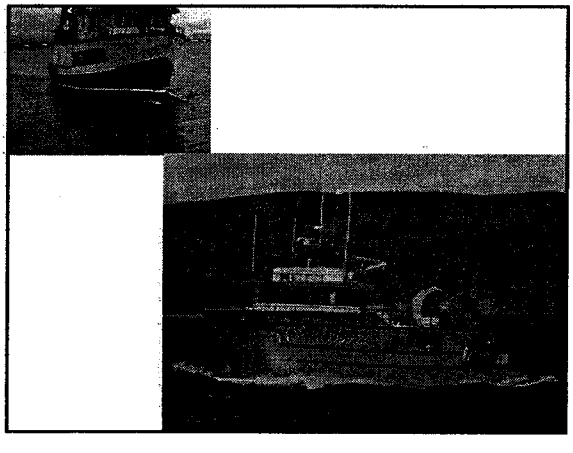
- Bond Strength Investigation for Retrofitting Fibreglass Hulls with Bulbous Bows and Other Appendages
- Performance Evaluation and Design Improvement of 65' x 30' x 30' Fishing Vessel (2001/2002)
- Performance Evaluation and Design Improvement of 65' Wave Piercing Catamaran Fishing Vessel (2001)
- Design and Performance Evaluation of Alternative Bulbous Bow Designs for 65' x 24' Fishing Vessel (1996/1997)

SAFETY RELATED CONSULTING:

- Various Bulbous Bow Designs for 65' and Smaller Fishing Vessels (1999 to Present)

BULBOUS BOW RELATED WORK





PERSONAL EMERGENCY LOCATOR TAG FOR INSHORE FISHERY

by

Des Power
C-CORE

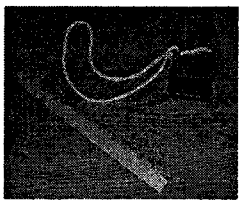
Personal Emergency Locator Tag for Inshore Fishery

- Objective: to develop an inexpensive, compact and lightweight personal emergency distress beacon
- Main target sector: commercial and recreational inshore fishery

- To be useful for inshore fishery,
  - Must have immediate notification of CCG of incident position
- EPIRB: Emergency Position Indicating Radio Beacon
  - Simple homing beacons (121MHz)
    - priced right (typically $200-$300)
    - No automatic notification of CCG
  - COSPAS/SARSAT (406MHz)
    - Automatic notification via satellite
    - Some have GPS
    - Typically $1000 or more
    - Large/bulky

121.5 MHz EPIRBs

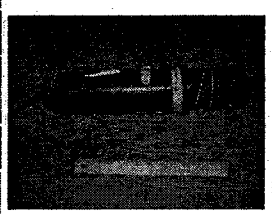
Sea Marshall



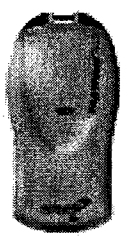
MINI B2

MOB Wristwatch

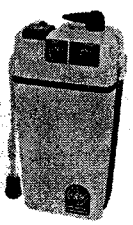
Vessel 406 MHz EPIRBs



Personal 406 MHz EPIRB



Fastfind



Personal 406

MicroPLB

Personal Emergency Locator Tag for Inshore Fishery

- Most desirable feature
  - Tag-like
  - Worn on clothing
  - Should not hinder normal activities on a small boat or vessel
- Device would also be useful in
  - offshore fishery
  - marine transportation sector
  - offshore oil production and exploration industry
  - inshore/freshwater recreational boating sector.

Features of Emergency Locator Tag

- Small, lightweight and wearable/attachable to clothing
- Inexpensive (several hundred dollars)
- Automated and manual triggering of distress event
- Provide notification to CCG a timely manner
- Features may include
  - onboard GPS,
  - VHF-DSC capabilities
  - AIS (Automated Identification System) compliance
  - 406 MHz homing beacon (less expensive, lighter weight version of COSPAS/SARSAT EPIRBs).

Occupational Safety on Board of Fishing Vessels

Ayhan Akinturk, NRC-IMD

1

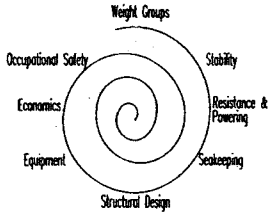
Introduction

Three Elements:

- Man
- Machine
- Environment

2

Ship Design



3

Effects of Platform Motions

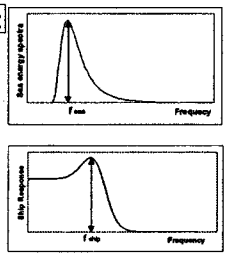
- Motion Sickness
- Motion Induced Interruptions
- Postural Stability

4

Design Rules

Shift of Peak Frequencies:

- Ship Response and Sea Energy



5

Design Rules cont'd

Constraints on RMS heave and pitch:

- RMS heave < 0.7 [m]
- RMS pitch < 5 degrees

6

Design Rules cont'd

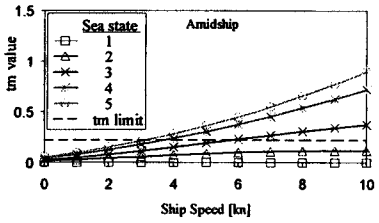
Postural Stability:

- $M1x + 0.1659M1y + 0.1133M1z < 0.22$

  M1 is the first moment of the acceleration spectrum

7

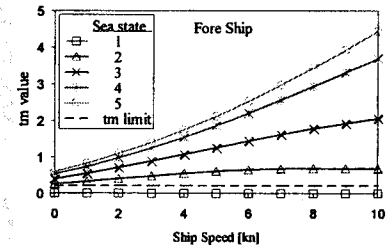
tm (cont'd)



$tm = M1x + 0.1133M1z < 0.22$

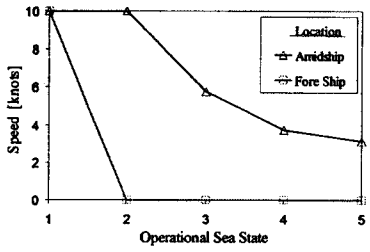
8

tm (cont'd)



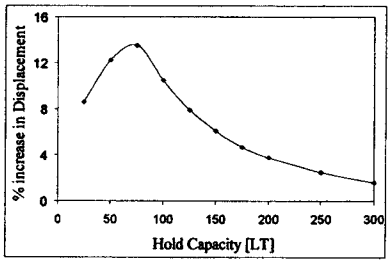
9

Maximum Speed



10

Effects



11

Future Research Directions

- Improvements in the algorithms to estimate vessels' motion characteristics – ship motions
- Better understanding of effects of motions – human factors

12

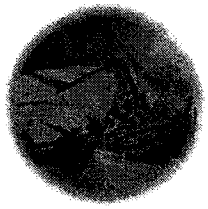
SafeCatch –
A Community Research Alliance on Fishing Health and Safety

by

Stephen Bornstein
NLCAHR/SafetyNet

SafeCatch

A Community Research Alliance on Fishing Health & Safety



SafetyNet

Community Research Alliance on Health & Safety in Marine and Coastal Work

Human Cold Working Conditions:
Surface Exposure to Cold
Cognition During Exposure to Cold
Work and Performance in Cold Deep-Sea Conditions

Oil & Petroleum:
Offshore Employment: Implications for Health & Well-Being of Individuals, Families & Communities
Occupational Health and Safety in Petroleum Refining

Fish Processing:
Occupational Asthma in Snow Crab Processing Workers
Cumulative Trauma Disorders in Snow Crab Processing Workers

Fishing Vessel Repair:
Risks and Prevention in Fibreglass-Reinforced Boat Building & Repair

Fishing:
SafeCatch

SafeCatch Community Alliance

Academic Partners:
Newfoundland & Labrador Centre for Applied Health Research
Memorial University of Newfoundland
Dalhousie University

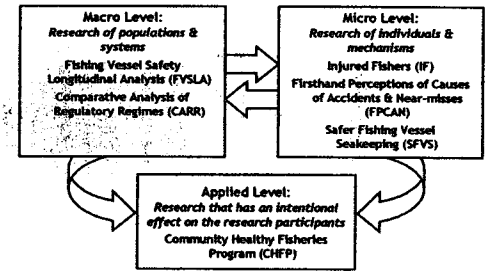
Research Partners:
Canadian Coast Guard
Department of Fisheries and Oceans
Health Care Corporation of St. John's
Institute for Marine Dynamics–National Research Council
Maritime Search and Rescue, Newfoundland
Newfoundland & Labrador Centre for Health Information
Newfoundland & Labrador Workplace Health, Safety and Compensation Commission
Offshore Safety & Survival Centre

Community Partners:
Fish Harvesters Resource Centre
Professional Fish Harvesters Certification Board
Small Fishing Vessel Safety Committee

Funding:
Canadian Institutes for Health Research
Memorial University School of Graduate Studies
Newfoundland & Labrador Workplace Health, Safety and Compensation Commission

SafeCatch

Inter-sectoral, inter-disciplinary and integrated research



SafeCatch–Fishing Vessel Safety Longitudinal Analysis (FVSLA)

Research on populations

Researchers:	M. Binkley, B. Neis, J. Guernsey, P. Navarro
Objectives:	Identify and interpret the factors that influence the rates of fish harvester injuries and fatalities and SAR incidents.
Design:	Linked database, statistical analysis
Applications:	Fishing occupational health & safety evaluation tool
Time Frame:	Winter 2002–Winter 2003
Partnerships:	Department of Fisheries and Oceans Fish Harvesters Resource Centre Maritime Search and Rescue, Newfoundland Newfoundland & Labrador Centre for Health Information Professional Fish Harvesters Certification Board Small Fishing Vessel Safety Committee Workplace Health, Safety and Compensation Commission

SafeCatch–Comparative Analysis of Regulatory Regimes (CARR)

Research on systems

Researchers :	M. Binkley, B. Neis, S. Bornstein, P. Navarro
Objectives:	Assess the regulatory regime of Canada's East Coast commercial fisheries to those of other selected countries.
Design:	Open-access contributions, comparative policy analysis
Applications:	Policy evaluation tool
Time Frame:	Winter 2002–Winter 2003
Partnerships:	Department of Fisheries and Oceans Academic researchers and public sector contributors from the selected countries: Iceland, Norway, Denmark, France, Australia, United States

SafeCatch—Injured Fishers (IF)

Research on individuals

Researchers : M. Murray, O. Heath, T. Heath-Rogers

Objectives: Identify and interpret the experiences of fishers with occupational-caused long term disability

Design: Interviews, qualitative analysis

Applications: Foundation for future research, detailed understanding of long-term disability

Time Frame: Winter 2002—Winter 2004

Partnerships: Health Care Corporation of St. John's
Newfoundland & Labrador Workplace Health, Safety and Compensation Commission

SafeCatch—Firsthand Perceptions of Accidents & Near-misses (FPCAN)

Research on individuals

Researchers : M. Binkley, M. Murray, B. Neis

Objectives: To investigate the perceived causes of fishing accidents and near-misses

Design: Interviews, qualitative analysis

Applications: Foundation for future research, detailed understanding of the chain of events surrounding accidents and near-misses

Time Frame: Winter 2002—Winter 2004

Partnerships: Offshore Safety & Survival Centre
Professional Fish Harvesters Certification Board

SafeCatch—Safer Fishing Vessel Seakeeping (SFVS)

Research on mechanisms

Researchers : D. Bass, D. Cumming, D. Molyneux

Objectives: Validation and refinement of a numerical model for seakeeping and Motion Induced Interrupts

Design: Naturalistic data collection (sea trials), numerical modelling (computer modelling)

Applications: Seakeeping computer models, evaluation tool for the effects of Motion Induced Interrupts

Time Frame: Spring 2003—Spring 2006

Partnerships: Canadian Coast Guard
CEC Marine Consultants
Institute for Marine Dynamics—National Research Council
Marine Search and Rescue, Newfoundland
Marine Search and Rescue Auditiary, Newfoundland

SafeCatch—Community Healthy Fisheries Program (CHFP)

Applied research on community safety education

Researchers : M. Murray, R. Rutherford

Objectives: Develop and carry out a pilot project for a community-based fishing safety program

Design: Community participatory research

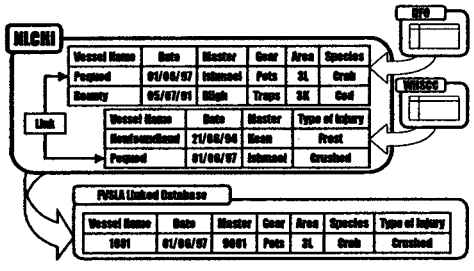
Applications: Community occupational health and safety education program

Time Frame: Spring 2004—Winter 2005

Partnerships: Offshore Safety & Survival Centre
Marine Search and Rescue, Newfoundland

SafeCatch—Fishing Vessel Safety Longitudinal Analysis (FVSLA)

Research on populations



SafeCatch

A Community Research Alliance on Fishing Health & Safety

Contact

Newfoundland & Labrador Centre for Applied Health Research
95 Bonaventure Avenue, Suite 300
St. John's, NL A1B 2X5
Phone: (709) 777-8469
Fax: (709) 777-6734
Web: www.safetynet.mun.ca

APPLICATION OF WIRELESS ASSET MANAGEMENT SYSTEMS TO FISHING VESSEL SAFETY

by

Steve Taylor
Cathexis

CATHEXIS

Overview

- Background on Cathexis Innovations Inc.
- Introduction to RFID
- What is ITEMS™?
- Technology Benefits
- Questions

Who We Are

- Cathexis Innovations Inc. is a privately owned R&D and consulting company
- Headquarters based out of St. John's, Newfoundland
- Primarily focused on the asset management needs of the industrial sector
- Specialize in providing turn-key solutions using wireless (RFID) technology
- Broad scope of experience in a number of fields.

ITEMS – Wireless Asset Management System

- Asset management presents a daunting problem to virtually all asset-intensive organizations
  - Assets are everything from computers and tools to compressors and valves.
- Poor asset management results in a tremendous cost due to both lost assets and reduced productivity
- Current methods are labor intensive, inefficient and inadequate
  - Paper tracking of asset location
  - Manual database entry
  - Inefficient with significant time lag

Fixed Assets (AMS) & Mobile Assets (PL)

- ITEMS approaches the problem on two fronts
  - Fixed Assets – in-field equipment, & infrastructure: pumps, compressors, etc
  - Mobile Assets – Tools, laptops, inventory, etc

Real-world Assets

IT Asset Management System

ITEMS AMS – Fixed Asset Management

- ITEMS (Integrated Tag Embedded Management System).
- Employs a wireless (RFID) technology to address the issues of asset management.
- Provides features such as:
  - Asset Management
  - Access to critical data in-field
  - Commissioning and certification
  - Enhanced preventative maintenance

MOTIONS and SAFETY for FISHING BOATS

Excessive Motions can lead to potentially hazardous situations threatening the health and safety of the crew.

Extreme Motions endanger the lives of the crew and the integrity of the vessel (possibly leading to loss of lives and/or loss of vessel).

The symptoms or consequences of excessive motion on human subjects are generally classified under the headings;

(1) Motion Induced Interrupts (MII)

Tipping, tumbling and slipping.

Can lead to physical injury, falling overboard, fatigue, back injuries, etc.

(2) Motion Induced Fatigue (MIF).

Can lead to carelessness, poor judgement, etc

(3) Motions Induced Sickness (MIS)

General physical, cognitive, psychological impairment.

1. ROLL REDUCTION DEVICES.

1.1 The Need.

% occurrence of wave heights for different wave periods in N. North Atlantic (world wide shown for comparison in totals).

Wave Ht.(m)	Wave Period (seconds)					
	2.5	**6.5**	**8.5**	**10.5**	**>10.5**	**Total %**
0 - 1 m	**14.0**	**3.4**	**1.0**	0.30	0.4	**19.0** (31.0)
1 - 2 m	**11.5**	**15.5**	**6.5**	1.5	1.0	**36.0 (41.0)**
2 - 4 m	2.0	**10.0**	**12.0**	7.0	4.0	**34.0 (23.0)**
> 4 m	0.1	1.5	3.0	3.5	2.0	11.0 (5.0)

● Typical Natural Roll Periods for Fishing Boats between 55 ft. and 65 ft. in length, 5.5 to 8.5 seconds.

● 25% Probability of Waves of 2 m height and typical period 7.5 to 8.5 seconds.

● Typical Roll angle in 2 m beam waves is 17° for a 65' boat 1/3 of the time (without bilge keels).

1.2 Types.

(i) Bilge Keels.

(ii) Bilge Fins.

(iii) Paravane Outriggers.

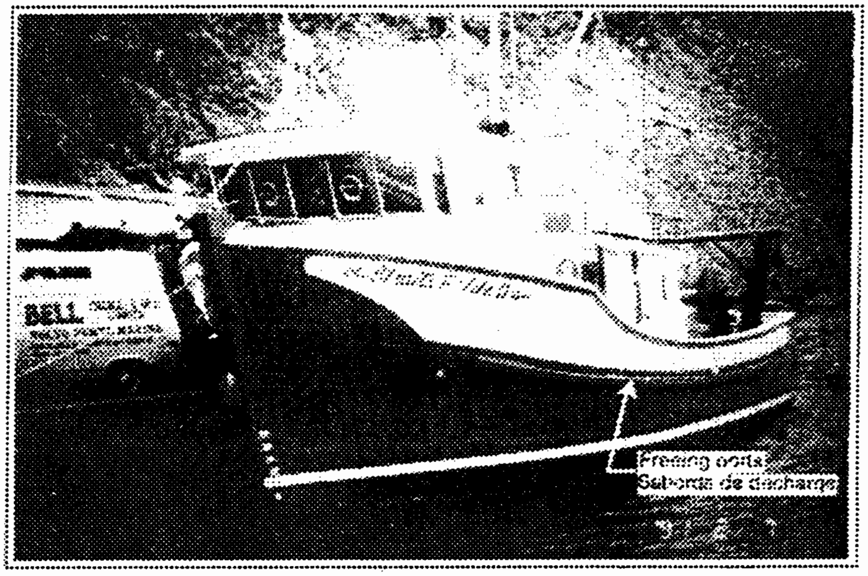
(iv) Anti-Roll Tanks.

Expected % Reduction in Roll Motion.

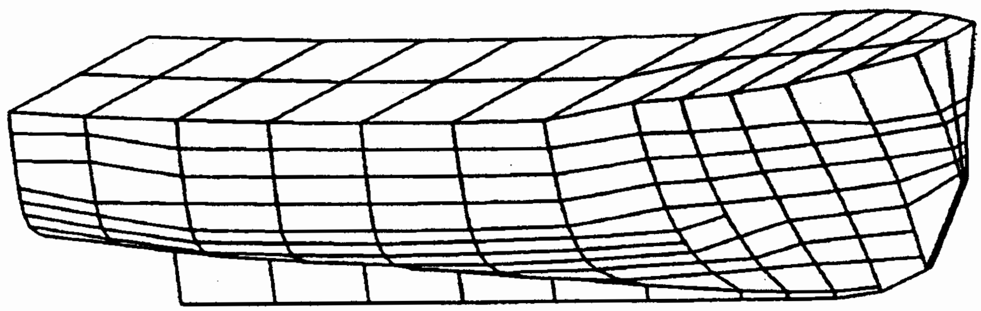
	Slow Speed	Steaming Speed
Bilge Keels	25 - 45%	30 - 50%
Bilge Fins	25 - 35%	40 - 60%
Paravanes	20 - 30%	40 - 50%
Roll Tank	50 - 70%	50 - 70%

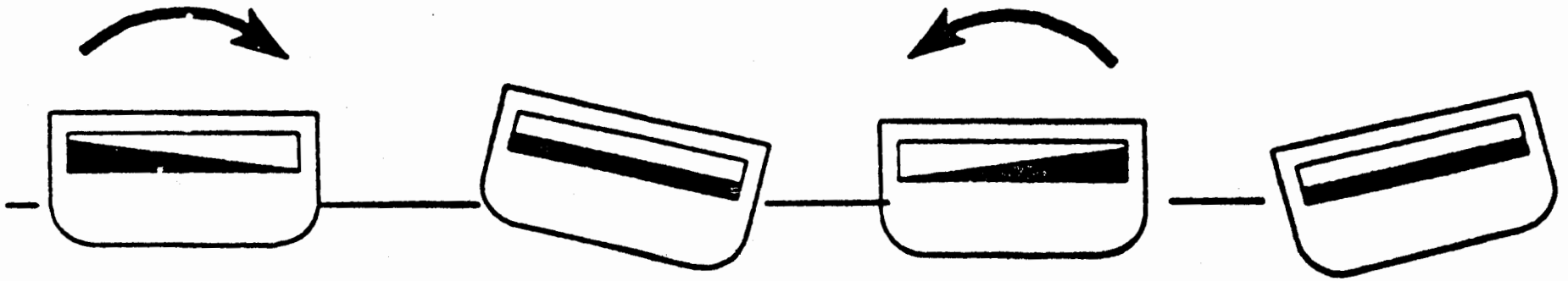
- **Each result depends on the particular design of the device.**
- **%Reduction may depend on Severity of Seastate**

(2)



"STRAITS PRIDE II"





(a) $t = 0$
Maximum roll rate to starboard; maximum stabilising moment to port.

(b) $t = \pi / 2\,\omega_e$.
Maximum roll to starboard; zero stabilising moment.

(c) $t = \pi / \omega_e$.
Maximum roll rate to port; maximum stabilising moment to starboard.

(d) $t = 3\pi / 2\omega_e$.
Maximum roll to port; zero stabilising moment.

ANTI-ROLL TANK REDUCTIONS.

	test 5	test 6	test 7	test 8	test 9
Stab.	1.18°	4.9°	2.7°	2.58°	2.12°
Unstab.	6.95°	7.84°	6.16°	5.96°	4.58°
Stab.	2.28°	3.54°	2.6°	2.24°	1.94°

% Reductions.

1st set	82%	38%	56%	57%	54%
2nd set	67%	55%	58%	62%	58%

Avrg.	75%	46.5%	57%	59.5%	56%

Table 3. Significant (single) amplitudes of roll for the 'Explorer'.

	test 1	test 2	test 3	test 4	test 5
Stabilised	error	5.1°	2.1°	3.5°	4.9°
Unstabilised	11.0	10.7°	5.9°	8.7°	10.3°
Stabilised	4.6°	3.9°	1.6°	4.4°	4.65°

% Reductions.

1st set	-	52%	65%	60%	53%
2nd set	58%	64%	73%	50%	55%

Average	58%	58%	69%	55%	54%

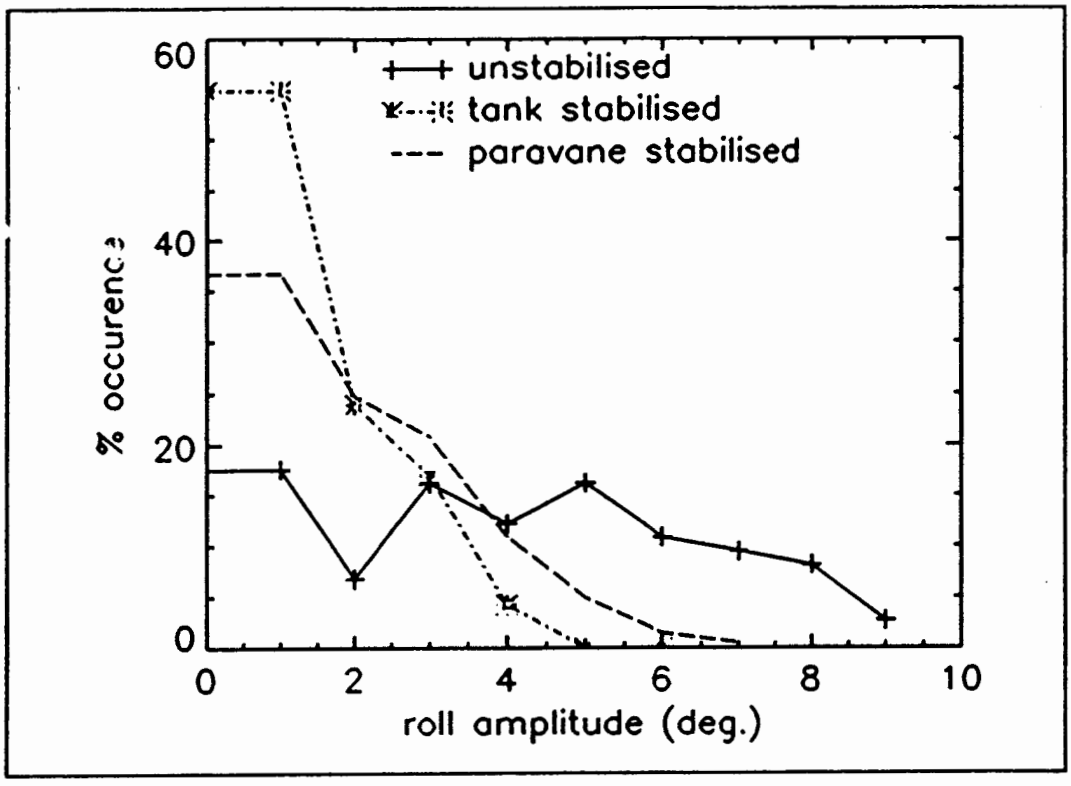
PARAVANE ROLL REDUCTIONS.

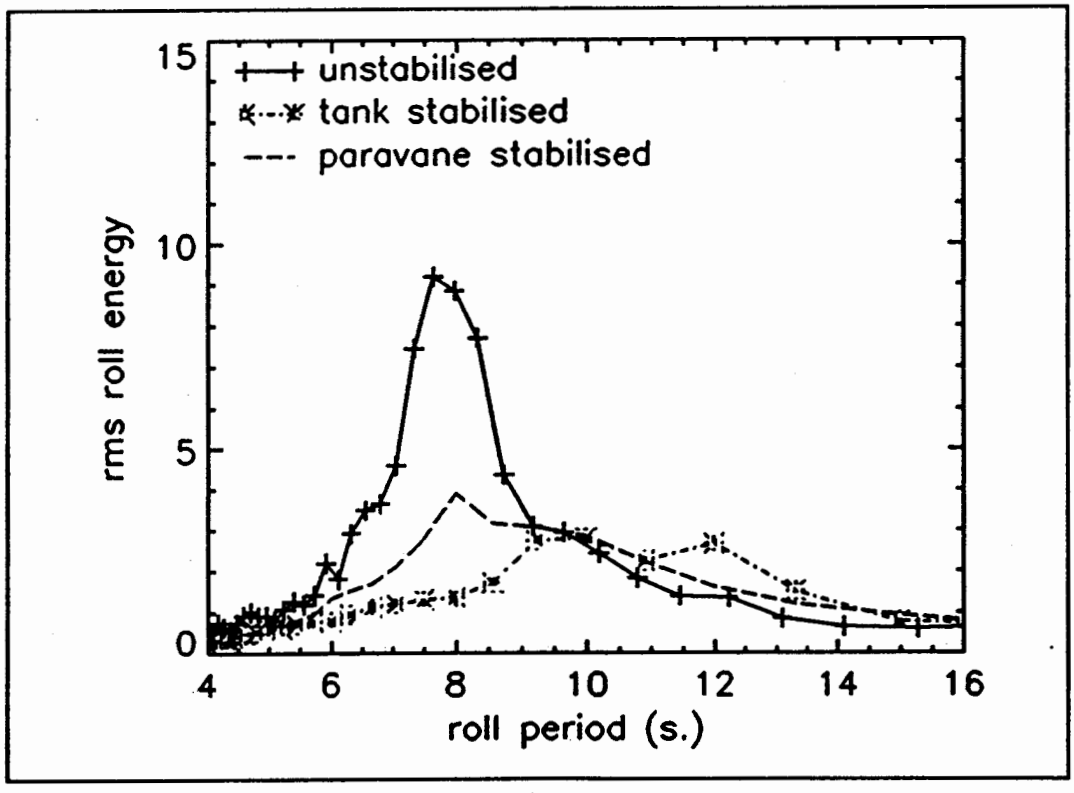
	Test
Stab.	3.69°
Unstab.	6.61°
Stab.	3.61°

% Reductions

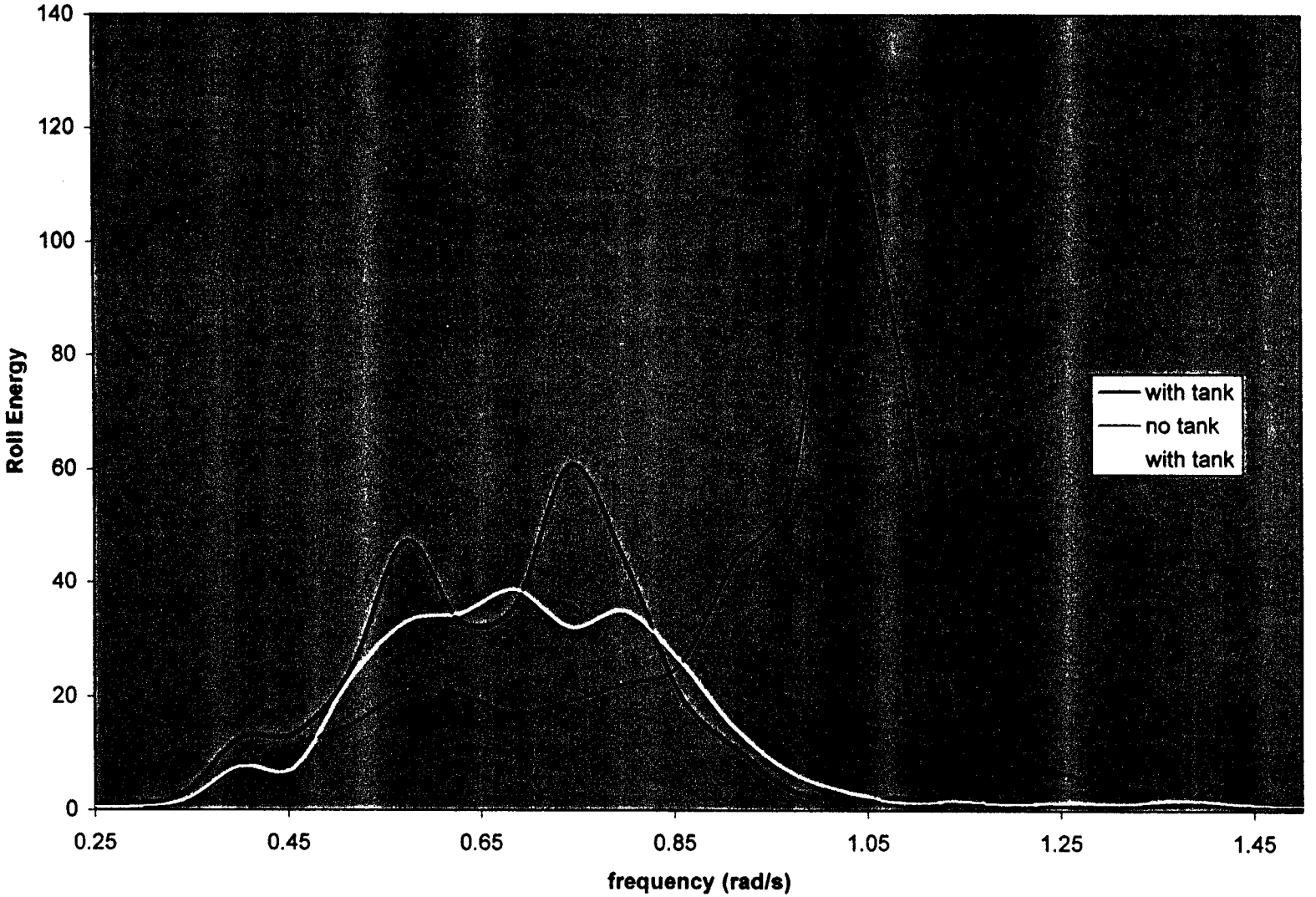
1st set	44%
2nd set	45%

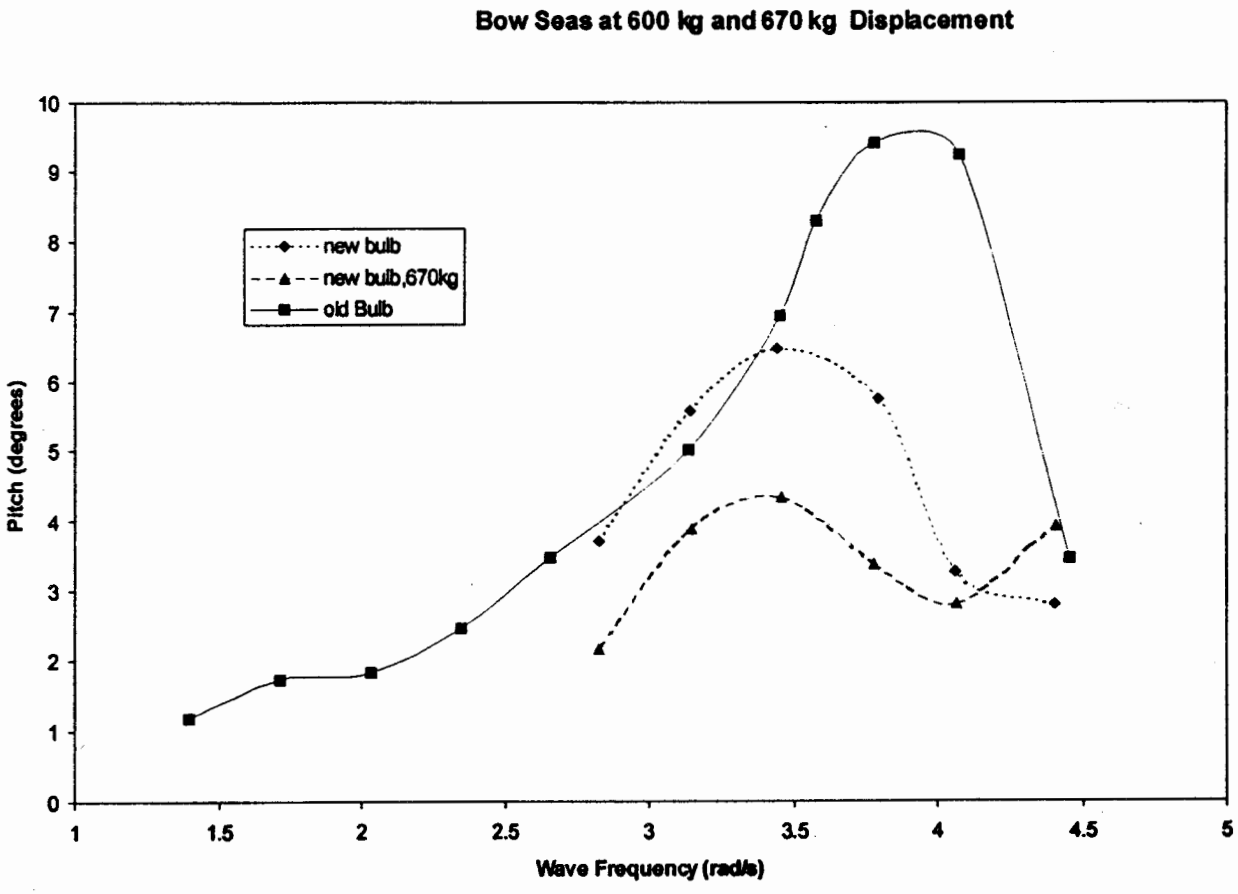
- Histogram shows ;
  - 60% of roll angles less than 3 degrees with tank.
  - 35% of roll angles less than 3 degrees with paravanes.
  - 20% of roll angles less than 3 degrees 'unstabilised'.


unstabilised
tank stabilised
paravane stabilised
% occurence
60
40
20
0
0
2
4
6
8
10
roll amplitude (deg.)


unstabilised
tank stabilised
paravane stabilised
rms roll energy
15
10
5
0
4
6
8
10
12
14
16
roll period (s.)

Lisa M, Sea Trials in Stern Seas





Bulbous Bows for Pitch Reduction.

CONCLUSIONS

A fundamental requirement to reduce accidents on board Fishing Vessels is to reduce motions.

This requires a careful design of both vessels and motion reducing devices.