Formal safety assessment regarding 65ft Newfoundland fishing boat stability hazard identification and risk control options

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SUMMARY

The International Maritime Organization Marine Safety Committee adopted Guidelines for Formal Safety Assessment as a means to make sound decisions with respect to the marine and shipping industries. The methodology is aimed at enhancing maritime safety, protection of life, health and environment through risk analysis and hazard identification. As part of an ongoing research project regarding the Formal Safety Assessment methodology and process, researchers at IOT and MUN are working together to complete a case study on 65ft Newfoundland Small Fishing Boat Stability using the FSA technique to verify if FSA is a methodology which is effective and useful to Transport Canada.

The report will describe the FSA process in brief, identifying and explaining the five step FSA process and will discuss the FSA workshop held at the Institute for Ocean Technology in March 2006. The report will then focus on hazards and possibly risk control options for the 65ft Newfoundland Small Fishing Boat Stability problem.

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FORMAL SAFETY ASSESSMENT REGARDING 65FT NEWFOUNDLAND FISHING VESSELS: HAZARD IDENTIFICATION AND RISK CONTROL OPTIONS

SR-2006-05

David Winsor

April 2006

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Summary

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1.0 BACKGROUND

Formal Safety Assessment process has been defined by IMO as a structured and systematic methodology, aimed at enhancing maritime safety, including protection of life, health, the marine environment and property by using risk analysis and cost benefit assessment. The method is applicable to consider safety of vessels in a global sense (all vessel systems), analyze subsystems or analyze individual aspects of safe vessel operations. It has applications in ship design stages and individual operational aspects of existing vessels. The decision making process using the FSA approach is transparent and well documented. The process can be used to validate existing and/or new regulations developed applying prescriptive or risk based principles.

2.0 HISTORY

In March of 1987, the Roll on – Roll off (Ro-Ro) Ferry, MS Herald of Free Enterprise was capsized just outside of Zeebrugge. 193 people lost their lives. This disaster prompted a report by Lord Carver who led the House of Lords Select Committee on Science and Technology to produce a report entitled "Safety Aspects of Ship Design and Technology." The report gave numerous recommendations on ship design, ship safety and safe procedures. One of the recommendations was:

Figure 1. MS Herald of Free Enterprise

'For the long term, we recommend a safety case regime for ship owners, based on preliminary safety goals agreed through IMO, administered by flag states. If necessary the EC should be prepared to impose a safety case regime unilaterally on ships of any flag carrying passengers, oil or hazardous cargoes in European Commission (EC) waters'

In response to the report, the UK Maritime and Coastguard Agency (MCA) realized that there was a lack in marine safety research, and that gap needed to be filled. Through various projects and research papers, the concept of FSA evolved. The UK government believed that the adoption of FSA would allow for the prioritization of safety issues at IMO. They also believed that the standards and regulations derived from such a method would be cost effective and proportional to the risks involved. The FSA process puts emphasis on the totality of hazards that a ship might encounter and then allow for risk assessment and risk control options to be developed.

In 1993, during the 62^{nd} session of the IMO Marine Safety Committee (MSC), the UK proposed a 5 step risk based approach to ship safety evaluation and assessment which was called Formal Safety Assessment (FSA). In 1996, a working group on FSA was established by IMO. A year later, a Circular on the Interim Guidelines on the Application of FSA to the IMO Rule Making Process (MSC Circ. 829/MEPC Circ. 335) was released and adopted by MSC and MEPC.

3.0 PROCEDURE

Formal Safety Assessment methodology is designed as a tool for IMO and other authorities and class societies to analyze and evaluate regulations, both existing and proposed. This evaluation is done in a probabilistic hazard and risk analysis method with focus on the frequency in which a hazard occurs and the consequences a hazard can cause. FSA is divided into a five step process:

1) Identification of Hazards
2) Risk Assessment
3) Risk Control Options
4) Cost Benefit Assessment
5) Recommendations for Decision-Making

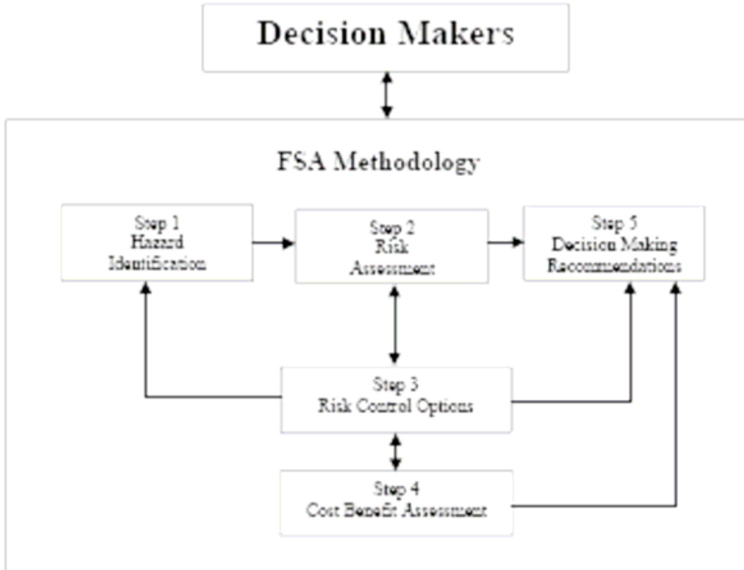

Figure 2. Flow Chart of FSA Process

FSA studies are also used as a proactive tool to evaluate the safety of ship systems. The process is applicable to subsystems or individual aspects of a vessel's operation depending on the scope of the study.

3.1 Identification of Hazards

The goal of step 1 is to identify and prioritize, by risk level, causes of accidents and their associated scenarios relevant to the scope of the assessment. There are two phases involved with hazard identification; the identification phase and the ranking phase.

The identification phase identifies possible hazards and hazardous situations that might occur in a system. By reviewing relevant past event histories of accidents and gathering advice from expert consultations the possible accident scenarios are thus identified along with their causes and mechanisms. The basic understanding of "what can go wrong here" is understood and discussed.

The second phase of step 1 discusses the probability of a given event occurring. Questions such as, "How likely is it that this event will occur?" "What is the consequence of the event?" are posed. Questions such as those mentioned aid in the determination of the frequency of occurrence of the identified hazardous events.

There are multiple techniques available for use in the Hazard Identification phase of an FSA study. These can include:

- Hazard and Operability studies (HAZOP);
- Failure Mode and Effect Analysis (FMEA);

- Fault Tree Analysis (FTA); and
- Event Tree Analysis (ETA)

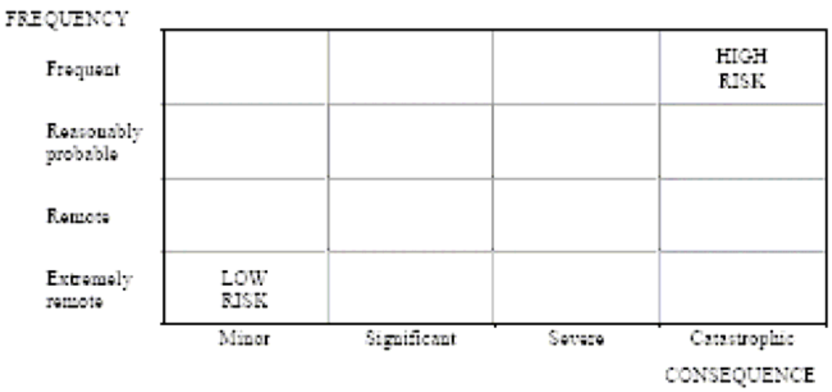

Figure 3. Example of a Risk Matrix

Through the methods shown above, the hazards are properly categorized and prioritized using a risk matrix with well-defined hazard probabilities and consequences. In a large scale FSA study; there are thousands of hazards and combinations of events leading to a hazardous situation, the importance of probabilities and consequences is then apparent, they aid in narrowing the scope of the hazards for risk assessment and risk control options. The list of prioritized hazards and possible accident scenarios are given as input into the Risk Analysis of the FSA.

3.2 Risk Assessment

Risk assessment is a systematic analysis tool which allows for the integration of information found in step one and considers the complex interactions of each factor to produce qualitative design insight and quantitative measures for decision making. This step in the FSA process identifies areas of high risk, primary contributors to risk for a specific hazard and the cumulative risk to people, property and environment.

Quantification of risk utilizes accident and failure data in conjunction with other sources of information as appropriate to the level of analysis. Where data is unavailable, calculation, simulation or the use of recognized techniques for expert judgment may be used. Through various sources and techniques, a risk model is formed. The model can then be used to assess the risk and compare it to predefined acceptable risk criteria. The model, a risk contribution tree, is designed in a logic cause and effect flow chart. With the information taken from experts and accident data, the risk contribution tree produces a model of the distribution of risk in an FN curve format.

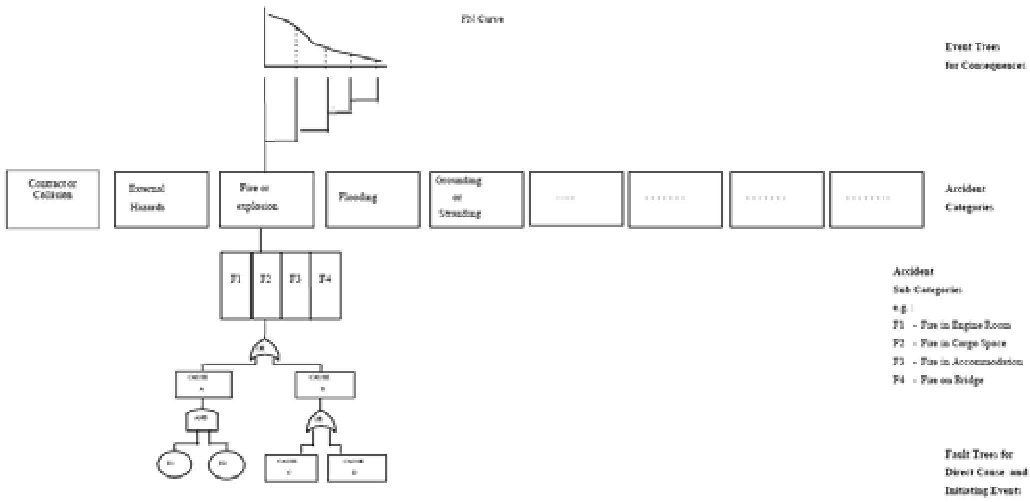

Figure 4. Example of a Risk Contribution Tree

Risk is defined as the combination of the frequency and the severity of the consequence (or outcome of an incident). Mathematically, using logarithms, risk can be indexed for better ranking. This enables the summation of the frequency and severity indices into a risk index.

$$\text{Risk} = \text{Probability} \times \text{Consequence}$$
$$\text{Log (Risk)} = \text{Log (Probability)} + \text{Log (Consequence)}$$

Absolute probabilistic risk criteria do not consider costs associated with them and they are formulated as a maximum level or risk that cannot be exceeded. The ALARP approach is more appropriate for an FSA study for determining acceptable risk criteria. ALARP or "As Low as Reasonably Practical" is defined as the region between broadly accepted risks and intolerable risks, also known as the tolerable region. Three levels of risk are presently broadly recognized:

- Intolerable (unacceptable risk that cannot be justified except for extraordinary circumstances)
- Tolerable (all risks should be in ALARP region)
- Negligible (broadly acceptable)

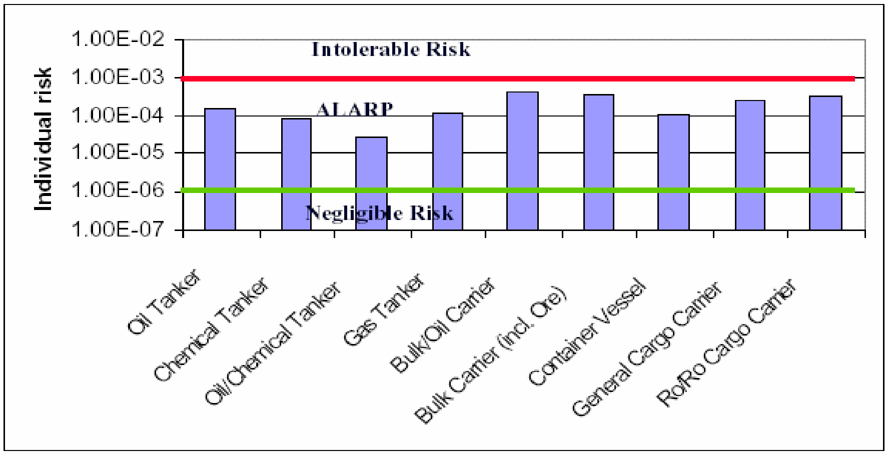

Figure 5. Annual Fatality Risk for various types of vessels shown with acceptable And intolerable risk levels with ALARP level in between

3.3 Risk Control Options

A risk control option (RCO) is an appropriate combination of risk control measures, which can control a single element of risk, reducing the likelihood of an accident or mitigate the possible consequences. Risk control measures should be identified for risks which are not satisfactorily controlled by measures already in place. The goal of step 3 is to identify risk reduction measures and group those measures into possible risk control options.

The selected RCOs should review historical risks and new risks recognized in foresaw accident scenarios (As found in step 1). The effort should focus on areas needing control. They should be selected based on:

- Risk levels (accidents with unacceptable risk levels are of high priority);
- Probability of occurrence (high frequency should be controlled irrespectively of severity);
- Severity (high severity should be controlled irrespectively of probability)
- Uncertainty (high uncertainty in frequency and consequences)

In general, they should aim at reducing the frequency of failure of a system and mitigating the failure's consequence. The overall objective of step 3 is to produce a group of RCOs that are assessed as effective in reducing the risks of the hazards found in step 1.

3.4 Cost Benefit Assessment

With cost benefit assessment, the RCO is given a monetary value and a cost of implementation is found. Cost benefit assessment compares the costs vs. the benefits of controlling the risk. Costs could be expressed in terms of the cost of averting a fatality, cost per-life-saved and the value of life. Benefits may also include reduction in fatalities, injuries, environmental and asset damage.

The IMO recommended indices for presentation of RCOs cost effectiveness in relation to safety of life are Gross Cost of Averting a Fatality and Net Cost of Averting a Fatality. They are defined as:

$$\text{GrossCAF} = \frac{\Delta C}{\Delta R}$$

And

$$\text{NetCAF} = \frac{\Delta C - \Delta B}{\Delta R}$$

Where,

ΔC is the cost per RCO

ΔB is the economic benefit per ship from the implementation of RCO (this might include pollution prevention)

ΔR is the risk reduction per ship, in term of fatalities averted, implied by RCO.

3.5 Recommendations for Decision-Making

Provide recommendations on relevant safety subjects to decision makers. This should be an unbiased and transparent comparison of each RCO based on cost effectiveness and reduction of risks. This final step should take into consideration all previous steps in order to make a rational recommendation based on the assumption of risk reduction to “As Low as Reasonable Possible” (ALARP) levels and cost effectiveness.

The results of step 5 should be an unbiased and transparent presentation of RCOs and their cost effectiveness in mitigating a potential hazard. At this point the process is finished and the recommendations for options will which improve safety onboard a vessel have been made.

4.0 FORMAL SAFETY ASSESSMENT WORKSHOP

The focus of this report and the focus of the work term have been to research and organize a small FSA project as a case study to verify if FSA is a viable method of decision making for Transport Canada. Collaboration with researchers at Memorial University (MUN) and the Institute for Ocean Technology (IOT) have lead to a small scope Formal Safety Assessment regarding Small Fishing Vessel Stability, later refined to Formal Safety Assessment regarding the Newfoundland 65’ Small Fishing Vessel Stability Problem.

In the period from Jan – Apr. 2006, the first two phases of an FSA process have taken place. A workshop was held for two days on March 21st – 22nd, 2006 at the Institute for Ocean Technology in St. John’s with members from both the academic community and the regulatory body Transport Canada, in attendance. Members from the industry were also invited but did not attend. The workshop was essentially a Hazard and Operability study which gave researchers a chance to get input into hazards and other problems facing the small fishing vessel fleet while giving members from Transport Canada a look at the FSA methodology and decision making process.

4.1 Discussions during Presentation

Two presentations given by researchers at IOT and MUN started the workshop. The presentations focused on FSA in general and then Fishing Vessel stability. Throughout the presentations, there was general discussion from the attendees and notes were taken from these discussions in order to identify possible hazards later in the workshop.

4.1.1 FSA presentation

The first presentation of the workshop was an Introduction to Formal Safety Assessment (FSA) and the FSA workshop. The presentation reviewed the FSA process, some cost benefit analysis, and past FSA studies which have been submitted to IMO on Bulk Carriers.
During that presentation the following points were brought up by members of the group:

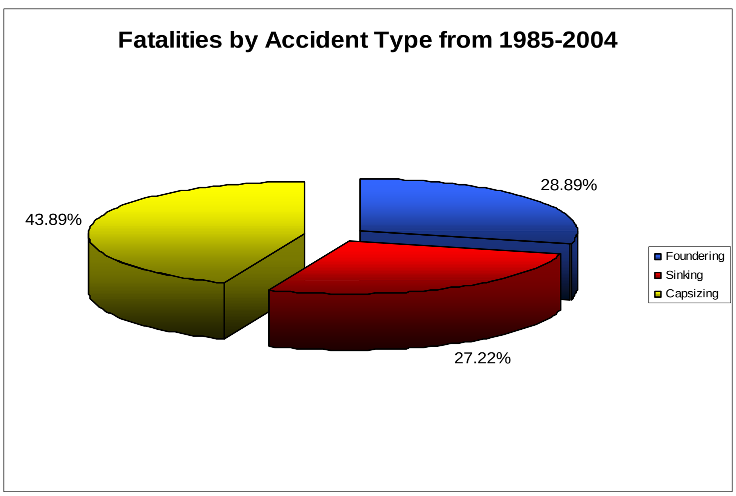

Figure 6. Fatalities in Canadian Stability Related Shipping Accidents

One of the riskiest professions on earth is that of the inshore Newfoundland Fisherman. They put themselves at risk on a daily basis to do their jobs catching fish and other seafood products. There is seems to be a mentality that the risks they endure are worth the rewards that they might receive if they land a big enough catch. The fishing industry is a multi million dollar industry, with quotas in the 300,000 tons per season, there is a *great economical incentive that these men and women make their quotas sometimes regardless of weather conditions or what personal risk.*

By building to the regulation and standards, the boat builder believes that the vessel safe. Regulations are most useful when they are new and people are consistently interested in them and asking about them. The current regulations pertaining to small fishing vessels are in need of updating to better reflect the evolution of the industry and the computer age.

Stability training is an issue. A lot of masters and crew members do not know very much about stability or the issues surrounding how the centers of gravity and buoyancy move as weight is added to a vessel.

Near misses generally do not get reported, but it is important for hazard identification that they do get reported. One person's near miss could be another's accident. This is a problem in many industries, most organizations collect near miss reports and incident report data to help mitigate potential problems in the future. In the fishing industry, this is hard to do and is generally not practiced with small vessels.

4.1.2 Small fishing boat stability presentation

A short presentation on Fishing Vessel Stability was also given. Discussion from the group was as follows:

The technical standard, TP 7301: Stability, Subdivision and Load Line Standards, STAB 4: Stability of Fishing Vessels defines static stability criteria which include a margin to account for dynamic stability. The extent of the margins is unknown.
Stability Booklets are written by Naval Architects and often it takes another naval architect to interpret it, a fisherman generally has trouble understanding the booklet. The booklets are not presented in a practical format suitable for fishermen. The format of the booklets has not been updated since 1975 therefore it does not account for computer

generated data. The important information, such as vessel restrictions, in the booklet is not emphasised anywhere.

4.1.3 Icing conditions

Regarding Icing Conditions the group discussed the following:

There are currently two sets of criteria for fishing vessels with regards to stability, with and without accumulated ice. The criteria for vessels with accumulated ice are lower than the criteria for vessels without. This seems to be counterintuitive.

Carrying ice should not lower the stability standards; if anything it should be a reason to increase the stability of the vessel. Ice is a risk to fishing vessels, it lowers the overall stability. Ice accretion can add between 15 and 20 tons high up on a typical 65ft inshore fishing vessel, raising the center of gravity of the vessel. When faced with an increased risk, the standards for safety have been lowered. Should not there be a higher criteria for stability be required when dealing with icing conditions?

4.2 Discussion of Hazards

We define hazards as a physical situation with a *potential* for human injury, damage to property, damage to environment, or some combination of these. It describes some inherent property that has the potential to develop into an accident in adverse circumstances to thereby cause harm.

From those discussions during the presentation some initial hazards that were observed and noted are discussed in the following sections of this report.

4.2.1 Stability booklet/crew knowledge of stability

The stability booklet is overly complicated and should be reformatted. Computerized output frequently results in booklets which are lengthy and contain tables specific to the software used to generate the booklet information. Masters who may be unfamiliar with the various software maybe unable to understand/interpret the Stability Booklet correctly. There is a general lack of understanding of the principles of stability. This may result in unsafe operations or operations that are not in accordance with the operations presented in the Stability Booklet.

4.2.2 Cargo/quota problems

Certain species of fish, such as capelin or herring, can cause free surface effects; if a vessel is involved in the capelin or herring fishery then it is required, by regulation, to have a Stability Booklet. Since the cod moratorium, there is new economic pressure to look for other species to fish. Fishing Vessel Masters who are perusing herring or capelin for the first time, may not understand some of the inherent risk and the regulatory requirements associated with those catches.

The regulations require that the vessel only be operated in accordance with the range of loading conditions presented in the stability booklet. If the Master operates outside of the conditions presented in the booklets it is his/her responsibility to make the changes in the booklet to ensure that the vessel continues to meet the regulatory criteria.

With the greater economics pressures and the changing species demographics small vessels are being pushed beyond the 200 mile limit to fish. These vessels were traditionally not designed for the types of seas and weather conditions past the 200 mile limit. The vessels may have difficulty returning home or accessing shore based search and rescue resources if an incident occurs.

4.2.3 Research problems

There was discussion regarding the inadequate understanding of local wave effects such as, rogue waves, and breaking waves on small fishing vessels. Understanding what causes these waves and their effect on small fishing vessels can be researched. When researching these stability issues, there should be a greater emphasis on dynamic effects. Capsizing is a dynamic problem, in order to understand dynamic stability time has to be incorporated as a parameter in the equations being developed. By eliminating the time domain, thus making the situation quasi static, a full dimension of complexity is removed from the problem.

4.2.4 Ship design

Currently there is a vessel length restriction which has forced small fishing vessels to grow abnormally in breath and height which can lead to fundamentally unsuitable design characteristics such as, poor directional stability and broaching, poor sea-keeping and greater fuel consumption due to higher resistance in the water. With a demand for deck space, vessels with extra shelter decks are being built, this upwards growth increases the vertical center of gravity and windage both of which reduce stability. Vessels which are abnormally ‘beamy’ exert high rolling forces on the crew causing fatigue and dangerous working conditions. To alleviate the high roll forces anti roll tanks are being installed to reduce the roll period. These are the only vessels in the world of this size that have anti roll tanks. The industry is unfamiliar with their operation and this in itself is a hazard.

4.2.5 Operational/regulation problems

Newfoundland fishing vessels also carry tanks generally not found on ships of the same size elsewhere in the world, such as Refrigerated Salt Water Tanks. These tanks exhibit free surface effects similar to the anti rolling tanks and this further degrades the stability of the vessel. RSW tanks are being fitted into vessels to increase the quality of crab stored in them. To keep the crab alive they have an aeration system which displaces the water from the tank and thereby guaranteeing the creation of free surface effects.

Regulations are in need of updating to better reflect the changing industry, the new types of vessels being built and equipment being used.

4.2.6 Minor stability problems

Minor stability problems can accumulate to cause a major incident. The factors leading to a capsizing can take a long time to occur. Such was the case in a recent incident where the vessel was ‘stable’ for many years before seemingly randomly capsizing. Examples of minor problems include creeping weight, modifications that haven’t been reported, and hanging weight.

The real focus was put on near misses. A vessel that lists to one side for an extended period of time, without capsizing, could raise concerns about the stability of the vessel. Masters should document their near misses to help identify if there is a potential stability issue present.

4.2.7 The evolution of the industry

The Newfoundland fishing industry has undergone a major change in the past 14 years. Since the moratorium on cod fish in 1992, the industry has suffered a major collapse and rebirth by harvesting new species to replace the cod. The location that they are now fishing has changed from a mainly inshore fishery to an offshore fishery outside the 200 mile limit. There are many different species being caught now, from redfish to herring, capelin, shrimp, crab and lobster. With all these species being caught, different equipment is needed for each fishery. There are many boats that leave port simultaneously carrying two or three types of gear for different fisheries. The holds for storage have changed; some boats are employing RSW tanks to store catches, volumes of flake ice are also increasing. The crews are out on the water longer, leading to fatigue.

Historically, Newfoundland fishing boats have evolved with modest parameters suitable for the environmental conditions found inshore. However the combination of new fisheries and the length restriction has forced the vessels to evolve into a unique style of boat, with unusual characteristics for fishing vessels. The newer boats are built wider, stiffer, and higher as a means to increase their deck space. The boats have changed, whereas the regulations have not for over 30 years. Lately that concern has been noted and addressed through Transport Canada's ship safety bulletins. In the past several weeks, Ship safety bulletins have been issued regarding stability.

Some of the new fisheries are not covered by Transport Canada's standards. The data for fish stowage is based on the White Fish Authority (1961). Transport Canada has currently issued an R&D contract with the Marine Institute to gather data on the new species and fishing storage methods.

5.0 SUMMARY AND PRIORITIZATION OF IDENTIFIED HAZARDS

The following list of hazards was tabled for further discussion on the second day of the workshop:

- Crew unable to understand/interpret stability data
- Emphasis on static and quasi static measures, but capsizing is dynamic
- Ratios for vessel parameters are abnormal such as L/B, B/D, and Block and Prismatic Coefficients
- Operating conditions which may lead to unstable conditions
- Crews not prudent in operations – economic pressures, lack of training, overconfidence
- Ship length restriction leading to fundamentally unstable designs
- Fish cargo storage leading to loss of stability
- Improper operation of stability devices
- Inadequate understanding of wave effects

- Inadequate regulations

Out of the list, three were chosen to continue the exercise and were deemed to be the most important of the problems.

5.1 Choice for Discussion

The three chosen were said to be the universal problems surrounding fishing vessel stability:

- Crew Training and understanding of stability and/or stability books
- Ship length regulations lead to inadequate design
- Changes in fishery and gear/services leading to vessel modifications and pressure to move further offshore.

6.0 DISCUSSION OF PRIORITY TOPICS AND RISK CONTROL OPTIONS

6.1 Crew Training and Understanding of Stability and/or Stability Booklets

6.1.1 Issues identified

Major issues identified as hazards with crew training and understanding of the Stability Booklets were:

- Understanding the principles of stability issues in a fishing vessel
- Format and Friendliness of the Stability Booklets
- Training of Masters and Crew members

One major problem with Stability Booklets is that they are written by naval architects and it takes a naval architect to understand it, further the data is often presented in a software specific format. Fishermen, the end user requires a more practical and user friendly format. It is the responsibility of the owner/master to ensure that the vessel is operated under the parameters listed in the Stability Booklet in accordance with regulations. In many cases, the Stability Booklet is disregarded by the Master due to lack of understanding or clarity.

Naval Architects and Masters should collaborate when developing the Stability Booklet to ensure that all anticipated operational conditions and habits are properly covered in the booklet. With the changes in the industry, vessels are subject to a bigger range of conditions for each booklet. The booklets are becoming longer because of numerous computer generated tables and graphs. This information is often intimidating to fishing vessel masters.

6.1.2 Risk reduction options

- Training videos and possible promotional TV spots for master and interested crew members to improve understanding of stability principles and Stability Booklet content
- Format of Stability Booklet to be redesigned and improve its friendliness with simple examples
- Stability Booklet format consistent for entire fleet nationally
- Stability Booklet to be developed by Naval Architect with owner/master to account for all actual conditions and operational habits
- Stability to be explained to the owner/master by Naval Architect
- Owner/master to sign Stability Booklet to confirm that it was developed to reflect his actual operations
- Develop a Bridge Card with a summary of important operational data/information
- Develop load computer to perform online stability calculations reflecting actual operational conditions
- Stability Booklet mandatory for all commercial fishing vessels
- Mandatory training and education required for masters of all commercial fishing vessels

- Some crew members required to be trained in principles of stability and Stability Booklet understanding as a contingency measure

The discussion also looked at organizing a Stability Workshop/Seminar to coincide with the Fall Marine Show in St. John’s. The workshop would be held at the Convention Center or the Delta and give fishermen the chance to learn about stability issues and perhaps release new software or stability loading computer if the system has been developed. Incentives from insurance companies to have new Stability Booklets and training done would be another bonus for the fishermen and a good reason to get their boats checked and learn more about stability. The thought was made that government could talk to the insurance companies about getting rates reduced or incentives for those who would complete stability training and have Stability Booklets made.

6.2 Ship Length Regulations is leading to Unstable Designs

6.2.1 Issues identified

There was only one major issue identified with this topic and that was the existing regulations were imposing any better designed to come forward.

There was great acclimation for removing length restriction. The length restriction of fishing vessels has resulted in:

- Unusual vessel geometry;
- very beamy;
- very high;
- lacking deck space low down;
- unpleasant motions resulting in crew fatigue;
- In order to increase the deck space decks are being built higher up on the vessel;
- Weights placed on the higher decks increase vertical center of gravity; and
- Unusually high prismatic and block coefficients result in poor longitudinal stability, sea-keeping and high fuel consumption

6.2.2 Risk reduction options

- Removing the length restriction

To quantify the benefit of removing the restriction is as follows:

- Better sea keeping properties, easier to work on deck and reduced crew fatigue
- Less resistance, better fuel economy, less engine exhaust pollution
- More deck space lower down for storage and fish processing
- Lower resultant Center of Gravity, better initial and overall stability
- Less windage area and lower windage centre, less wind heeling moment
- Better directional stability and sea-keeping
- Reduces the need for shelter decks
- Reduces the need for anti roll tanks and other roll stabilizing devices

This regulation was useful in the years when the cod fishery was the primary industry, however, with the change in the fishery; the length restriction is unnecessary and is a potential hazard. Overall the opinion was that less regulation was a good thing in terms of ship length. By removing the restriction, the vessels become safer, more economical and environmentally friendly.

6.3 Changes in Fishery, Gear and Services leading to vessel modifications and pressures to move further offshore for catches

6.3.1 Issues identified

Since the moratorium on codfish in 1992 the following changes have been seen:

- New species are being harvested
- There has been a migrating change from the inshore fishery to a predominantly offshore fishery

- There are multiple species being caught at a given time, different equipment is required for each species so vessels are leaving port with multiple sets of gear in the same voyage
- Modifications to vessels have occurred to accommodate the longer distances such as increased consumables (fuel and water)

This has led to more hazards such as:

- Increasing exposure to hostile environment due to longer trips
- Crew fatigue: longer working hours, no room to rest during fishing voyage no room for larger crew
- Reduction of overall stability due to a reduction in the reserve of buoyancy caused by additional weight from installed larger engines, carrying more fuel, more fishing gear, and more space for storing catch
- In some cases those modifications were not reflected in changes to stability booklets resulting in vessels not meeting regulatory stability criteria and operating outside Stability Booklets' specified conditions
- Stability booklets getting more complicated due to new/additional operational conditions

6.3.2 Risk reduction options

- All commercial fishing boats owner/operator complete an annual self check safety assessment (check list) signed and delivered to Transport Canada
- Any construction/modification job performed should be reported to TC/CCG by owner/operator and/or shipyard

According to Transport Canada, inspections are currently adequate and are working effectively some improvements can be made in the way in which the stability regulations are applied. Changes may occur within the 4 year inspection period of a vessel however the owners are supposed to report these changes to Transport Canada.

The bigger hazard is the antiquated small fishing vessel regulations and the stability standard. The regulations need to be rewritten to better reflect the advances in the advances in the industry and evolution of vessel design. The standard (TP 7301) needs to be rewritten it was last revised in 1975 prior to the wide spread use of personal computers. There are many regional safety differences and the wording of the regulations and the TP can be tightened to avoid loopholes.

7.0 CONCLUSION

To date, the FSA study which is ongoing at IOT has been successful. In a two day workshop, hazards and risk control options were tabled and discussed. Work is continuing, the list of hazards is now to be prioritized and the FSA study will focus on the Cost Benefits of these RCOs highlighted in this report. A report to Transport Canada is also in the draft stages. It is difficult to determine if FSA is an effective method of decision making at this point, in the past FSA studies take between 2 and 4 years to make recommendations for decisions. In order to make effective decisions, all the risks must be evaluated and risk control options have to be analyzed in a cost-benefit manner. Stability issues facing Newfoundland vessels have received media coverage lately with emphasis on the Ryan's Commander Disaster, an accident off the coast of Newfoundland with two men losing their lives. With further research into stability and utilizing the FSA methodology to make decisions, the likelihood of accidents occurring can be reduced in both a social and economical effective way.

8.0 REFERENCES

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