日本財団
The Nippon Foundation

平成２２年度

東アジア地域における
海上安全と事故調査のためのセミナー

報　告　書

平成２３年３月

財団法人　海難審判協会

目　　次

資料「東アジア各国等の船舶事故調査報告書」

Ⅰ　セミナーについて

1　セミナーの目的

船舶事故調査をめぐっては、2008 年 5 月、国際海事機関（IMO）第 84 回海上安全委員会（MSC84）において、「海上事故又はインシデントの安全調査のための国際基準及び勧告される方式に関するコード」（事故調査コード）が採択されるとともに、SOLAS 条約第 XI－１章第 6 規則が追加され、昨年の 2010 年 1 月 1 日に発効したことによって、事故要因やその他の安全上のリスクを明らかにし、海事業界における安全上の問題への取り組みに資するなどの原因究明機能が国際的に求められるようになった。

事故調査コードの主な義務規定は、①すべての「非常に重大な海上事故」は、このコードによって調査されなければならない（第 6 章）。②海上事故が領海内で発生した場合は、旗国及び沿岸国はいずれの国が調査を行うか、あるいは両国がそれぞれの調査を行うかを合意するために協議をしなければならない（第 7 章）。③すべての実質的な利害関係国は、海上安全調査国に実行可能な範囲で協力をしなければならない。海上安全調査国は、実質的な利害関係国に実行可能な範囲で参加の機会を提供しなければならない（第 10 章）。④海上安全調査国は、非常に重大な海上事故に対して行った海上安全調査について、海上安全調査報告書の最終版を IMO に提出しなければならない（第 14 章）などとしている。

また、IMO義務要件実施のためのコードでは、旗国の行う海上事故調査は、適した資格を有し、船舶事故に関連する事項に堪能な調査官により行うべきである、旗国は海上事故又は海上インシデントの場所に関わらず、この目的のために資格ある調査官を準備すべきであるとしている。

これに準拠した船舶事故調査官の調査能力向上については、事故調査全般又は特定の分野に関する研修の実施、定期的な情報交換、技術的及び専門的知識の共有を目的とした訪問や会議等といった取り組みが各国の相互協力のもと行われている。

こういう中で、東アジア海域で重大かつ深刻な船舶事故が発生する現状に鑑み、当海難審判協会は、日本財団の助成を受け、この地域の船舶事故調査官を我が国に招請し、これに我が国の船舶事故調査官が参加することで、事故調査に係る知識の向上と併せて国際協力の促進を図ることを目的として「東アジア地域における海上安全と事故調査のためのセミナー」を実施した。

なお、今回のセミナー対象者は、事故調査経験３年以上の担当者とし、またこれらの趣旨に則り、東アジアの諸国及び我が国の船舶事故調査官の事故

調査能力の向上を図るために、英国クランフィールド大学から事故調査の専門家２名を招聘して実施したものである。

２　参加国・地域及び組織

セミナーには、8 カ国・地域から、35 名の船舶事故調査官が参加した。

① 中華人民共和国
Senior Investigator
China Maritime Safety Administration

Intermediate Investigator
China Maritime Safety Administration

② 中華人民共和国香港特別行政区
Survey of Ship／Marine Accident Investigation Section
Hong Kong Marine Department

③ インドネシア共和国
Head of Marine Safety Investigation Sub-Committee
National Transportation Safety Committee-Indonesia

④ マレーシア
Marine Officer
Marine Department Peninsular of Malaysia

⑤ フィリピン共和国
Chief of Staff　Coast Guard Intelligence Force
Philippine Coast Guard

⑥ 大韓民国
Investigator
Korean Maritime Safety Tribunal

⑦ シンガポール共和国
Senior Marine Surveyor
Maritime and Port Authority of Singapore

⑧ 日本
国土交通省　運輸安全委員会

国土交通省　海難審判所

3　開催期間・場所

①　セミナー日程

平成２２年１１月２９日（月）から１２月３日（金）までの５日間

②　セミナー会場

平成２２年１１月２９日（月）

千代田区平河町２－４－３　　ホテル　ルポール麹町

平成２２年１１月３０日（火）～１２月２日（木）

千代田区平河町２－６－４　　海運クラブ

平成２２年１２月　３日（金）午前

千代田区麹町４－５　　海事センタービル

4　セミナーの内容

（１）講師

① **Prof. Graham Braithwaite**（グラハム ブレイスウエート）

グラハム ブレイスウエート教授は、世界的に有名な航空機事故調査コース、事故調査の基本コース、航空業務管理者のための事故調査コースなどの継続的専門能力開発講座の講座主任を務めている。同教授は、事故およびインシデントの調査、ヒューマンファクター、安全管理、文化が安全に及ぼす影響などの研究テーマを専門にしている。

ブレイスウエート教授は、2003 年にクランフィールド大学安全事故調査センター長として同大学に着任し、2006 年、航空輸送学科長（Head of the Department of Air Transport）に就任した。

ラフバラ大学（Loughborough University）の理学士号（優等）（輸送管理・輸送計画学）と博士号（PhD）（航空安全管理学）を保有し、王立航空協会のフェローを務めるほか、国際航空安全調査官協会のメンバーでもある。

② **Mr. Nick Beer**（ニック　ビヤー）

クランフィールド大学安全事故調査センター客員フェロー

ニック　ビヤー氏は、英国運輸省海難調査局（MAIB）出身で、同局では主任調査官兼航海専門セクション長（Head of Nautical Specialism）を務めた。MAIB への入局前は、27 年間にわたって英国商船に勤務し、そのうち 22 年間は、英国調査船 James Clark Ross に乗務して同船の指揮を執った。ビヤー氏は、特別船長（extra Master）の資格を持ち、航海研究所の評議員を経て現在同研究所のフェローを務めると同時に、同研究所文書・技術委員会（Papers and Technical Committee）の副委員長の地位に就いている。1994 年に MAIB に入局して以来、ビヤー氏が手がけた重大船舶事故の数は 60 件を超え、記録データを活用した調査に多く携わっている。ビヤー氏は、航海データ記録装置に関する調査局側の代表として、国内外のさまざまな委員会に出席し、後には MAIB スタッフの教育研修責任者も務めた。2009 年に MAIB を退職した後は、国際海事機関（IMO）、国際船舶事故調査官会議（MAIIF）、欧州海事安全機関（European Maritime Safety Agency: EMSA）等の国際機関を対象に、調査官研修の立案および実施に関する協力を行っている。また、ビヤー氏は、2004 年にクランフィールド大学がマルチモード（複数輸送モード）調査官コースを開講して以来、同大学で教鞭を執ってきた。

（２）プログラム

コースは、事故調査プロセス全般、事故の通知、初期対応、証拠の確認と収集、ヒューマンパフォーマンス、分析テクニック、レポート作成技術指導及び船舶事故のケーススタディを使用しての実践練習である。

講義内容は、概略以下のとおりである。

① 事故調査の目的及び事故調査関連法規
② 証拠収集
③ ヒューマンファクターの調査
④ 目撃者・証人のインタビュー
⑤ 調査官による分析
⑥ 事故調査報告書の作成
⑦ 関係者との協力
⑧ 事故調査の国際協力
⑨ 演習

① 事故調査の目的及び事故調査関連法規

○なぜ調査をするのか

○なぜ事故が起きるのか

○事故調査の目的

○事故に対する二種類のアプローチ

○ヒューマンエラー

○責任の追及を行わない調査

○独立性

○調査能力

○良い調査官とは

○調査官の役割

○事例紹介

・ヴァーサ号（VASA）の転覆（1628 年）

・バーケンヘッド号の遭難（1852 年）

・タイタニック号の遭難（1912 年）

○調査に関する国際規定及び IMO への報告

・UNCLOC／SOLAS／MARPOL／満載喫水線条約／STCW／トレモリノス条約（漁船が対象） など

○1987 年--ヘラルド オブ フリー エンタープライズ号転覆

・この事故の教訓から、独立した調査の必要性が認められるようになった

○インシデントの調査

○法的枠組

・SOLAS 第 XI-１章 第 6 規則

・事故調査コード MSC 255(84)

・欧州理事会指令 2009/18/EC

・事故及びインシデントの調査に関する各国の法制度

② 証拠収集

（証拠の収集及び記録）

○何が証拠となるのか
○なぜ証拠を収集するのか
○証拠はどこから収集するのか
○どのようにして証拠を収集するのか

（技術的証拠）

○VDR（航海データ記録装置）
○ECDIS／ECS データ
○AIS（船舶自動識別装置）
○GPS
○電話
○その他のデータ・VGA2USB
○MADAS（事故データ統合解析ソフト）

③　ヒューマンファクターの調査
○ヒューマンファクターとは
○人はなぜ事故を起こすのか
○ヒューマンファクター問題の調査に対する障害
○エラーを引き起こす要因は何か
○有用な情報
○睡眠に関するいくつかの事実
○疲労に影響を及ぼす要素
○調査手法
○SHEL モデル
○Reason によるエラーの分類
○文化 - 事故の多くは文化に根差している
○組織文化を調査する
○ヒューマン パフォーマンスに関する共通の課題

④　目撃者・証人のインタビュー
○インタビューの前に実施すべきこと
○インタビュー計画の内容
○インタビューの手法
○インタビューで注意を要すること
○記憶の想起

○テープレコーダー、デジタルレコーダーの使用
○証言の正確性を判断する

⑤　調査官による分析
○分析の方法
○絶対的原因と推定原因
○分析とは何か
○分析的推論
○調査過程における分析の種類
○時系列表示情報
○証拠の整理
○マトリック分析
○要因分析
○安全システム
○ATSB 調査分析モデル
○安全性の問題に関する分析
○事例研究
・Ro-Ro フェリーが、船首ドアを開放状態にしたまま出港、船長が加速すると、本船は急激な浸水によって横に傾き、砂州上に転覆した

⑥　事故調査報告書の作成
○なぜ報告書を作成するのか
○報告のタイミング
○報告書を作成するための準備
○草案の作成と編集
○最終報告書の書式－基本原則
○文体
○具体的な書き方のヒント
○避けるべき表現／言葉
○原因（Cause）
○勧告
○安全対策のスペクトル
○添付資料
○最終報告書

⑦　関係者との協力

○一般的留意事項

○関係者

・直接関与者（船舶所有者、乗組員、証人、生存者）

・近親者（親類）

・他の調査当事者（警察、規制当局、保険会社）

・マスコミ

・政治家

⑧　事故調査の国際協力

（事例）

・1993 年 - ウエスタン ウィナー号・ブリティッシュ トレント号衝突

・1994 年 - エストニア号沈没

⑨　演習

○事故発生通知後の初期対応

・受領した事故発生の情報をもとに、取るべき対応を検討する

現場派遣までにやるべきこと

現場での最初の 1 時間で優先的にやるべきこと

関係機関との連携

マスコミ対応

○口述聴取

・回答者の記憶は質問者によって影響を受ける

映像（踏切で大型車に接近した列車、ヘリコプターの墜落）を見た目撃者の証言と、調査官の質問をとおして検証する

○事故調査・分析

・乗組員が水密ドアに挟まれて負傷した事故の模擬調査

事故発生通知及び初期情報をもとに調査項目を検討

必要に応じ追加の情報収集又は口述聴取

事故原因の分析

○勧告

・模擬調査で得られた結論をもとに勧告案を作成

分析から明らかになった組織上及びシステム上の問題点を各グループで考察し、勧告を立案して、クラスで発表する

Ⅱ　東アジア各国等の事故調査等の現状

東アジア各国及び地域の船舶事故調査等の現状については、以下のとおり報告がなされた。

1　近年、各国等で発生した船舶事故及び各国等が関係した船舶事故の態様や原因、調査方法、国際協力について（以下は、原文(英文)の和訳である。）

（中華人民共和国）

報告

「2009 年 11 月 5 日に中国広州において発生した高速旅客艇 San Bu と貨物船 Yue Guang Zhou Huo 0217 の衝突に関する調査報告書」

以下については、報告書の主要な部分を抜粋して記載したが、詳細については、資料「東アジア各国等の船舶事故調査報告書」を参照されたい。

・概要

2009 年 11 月 5 日 19 時 53 分 40 秒、広州市番禺区フー・リアン・ガン（Fu Lian Gang）水道沙北（Shabei）渡船場上流約 140 メートルの地点で、中国香港特別行政区から中国広州市番禺（Panyu）区蓮花山（Lianhuashan）旅客埠頭に向かって航行中であった高速旅客艇 San Bu が、民間貨物船 Yue Guang Zhou Huo 0217 と衝突し、その結果、San Bu の左舷側中央喫水線上部に位置する低層部旅客室の隔壁に裂け目が生じ、乗客 2 名が死亡、9 名が負傷したほか、Yue Guang Zhou Huo 0217 の船首部コンベヤーが破断した。

・事故の調査

事故発生後ただちに、本事故の調査を目的として、中国海上安全監督局内部に専門調査チームが結成された。同調査チームは複数のグループによって構成され、各グループは、チームの結成と同時に、事故をさまざまな側面から調査するため、互いに協力の上、同時並行的に、それぞれの専門分野に基づいて調査作業を開始した。高速旅客艇の乗客に対しては、聞き取り調査を実施し、多数の乗客から事故についての証言を得た。また、各調査官は衝突した両船への

立ち入りを行い、現場の検分及び重要な乗組員への聞き取り調査を実施したほか、関連ビデオ映像テープのコピー、航海日誌、法定証明書類、保守記録、手順書、その他許認可関係等の各種関連書類のコピーを入手した。

本事故に関しては、広州海上交通センターからも関連情報を入手した。そのほか、調査官は San Bu に対し、ウォータージェット推進システム等についての事故後検査の実施を要請した。検査の実施後、検査報告書のコピーが中国海上安全監督局に提出された。

2.5　事故の原因

San Bu が、航行規則を遵守せず、安全速度を確保せずに航行する中、右舷側主エンジンが突然減速したため右舷方向に旋回する結果になったこと、及び両船舶の操船が不適切であったことが、本事故の直接原因である。

2.5.1　San Bu

2.5.1.1　同船は、会社が定めた複雑な水路を航行する場合の安全管理手順を遵守していなかった、

幅が狭い上に通行の激しいフー・リアン・ガン水道内を航行する場合、船長には、多くの船舶が頻繁に通行する複雑な水路内で他船との衝突を柔軟に回避するために十分な操縦性を確保する必要があることから、2 基ある主エンジンを別々に運転することが義務付けられていたが、船長はこの義務を履行せず、2 基の連結運転を続けたために舵効が低下し、その結果柔軟な操船ができなくなった。

2.5.1.2　San Bu は、複雑水域での安全速度を確保せず、衝突を回避するために必要な船員の常務（good seamanship）も履行されていなかった。

San Bu は、フー・リアン・ガン水道沿いにある盤龍（Pan Long）石油備蓄基地付近の沖合に到達した時、最初に接近してきた 2 隻の小型船を左舷対左舷で航過することにした。しかし、続いて接近してきた 3 隻目の小型船（後に Yue Guang Zhou Huo 0217 と判明した）については、衝突の回避に必要な信号灯に関する合意を行わなかったことにより、衝突の危険が生じた。このような状況の場合、船長は衝突リスクを判断するための時間を十分に確保するために、必ず減速した上で回避行動をとる必要があったが、同船は減速を実行せず、第 3

船に関しては右舷対右舷で航過することを示す緑色の閃光を点滅させただけであった。狭隘な水路を航行中に、最初の 2 隻を左舷対左舷の航過によって回避した後、第 3 船を右舷対右舷で航過しようとした高速艇 San Bu の行動は、1972 年 COLREGS 規則第 6 条及び第 8 条に記載された船員の常務（ordinary practice of seaman または good seamanship）に反する行動であった。

2.5.1.3　右舷側のウォータージェット推進システムに異常が生じた際に船長が行った緊急対応行動は不適切であった

San Bu が 3 隻目の小型船を右舷対右舷で航過するために左舷に回頭した際、右舷側ウォータージェット推進システムに突然異常が生じたが、その時に船長が最初にとった行動は障害アラームの警告音を消すことであった。

所属会社の安全管理システムのマニュアルには、航海中ウォータージェットに異常が生じる場合がある旨の記載があり、船長も実際にウォータージェットの異常が発生したケースがあったと証言している。したがって、航海中ウォータージェット・システムに異常が生じる可能性があることは予測可能であったわけで、事態の発生は不可抗力ではなかった。

右舷側ウォータージェットが異常を示した時点での正しい措置は、2 基の主エンジンを直ちに個別運転に切り替え、左舷側のエンジンを減速して両機関のバランスを維持することであった。船長が実際に行った行動は不適切であり、衝突の回避に役立つものではなかった。

2.5.2　Yue Guang Zhou Huo 0217

2.5.2.1　不適切な見張り

San Bu は、前方から航行してきた 3 隻の小型船を安全に航過するため、左舷対左舷での通過を要請するために赤色の閃光を点滅させた。この要請に対し、最初の 2 隻は同様に赤色の閃光を点滅させて左舷対左舷の通過に同意を示したが、3 隻目（Yue Guang Zhou Huo 0217）は、視界が良好であったにもかかわらず、赤色閃光を点滅させながら前進してくる San Bu を確認できず、最初の 2 隻のような左舷対左舷の通過措置を実施しなかった。この事実は、Yue Guang Zhou Huo 0217 が適切な見張りを怠っていたことを示すものである。

2.5.2.2　規則どおり水路の右側端に寄って航行しなかったことが、San Bu と衝突する危険を招いた

フー・リアン・ガン水道は典型的な狭隘水路で、この水路を航行する船舶は安全な範囲内でできる限り水路の右側端に寄って航行しなければならないが、Yue Guang Zhou Huo 0217 はこの規則を守っていなかった。

2.6　その他の判明事実

2.6.1　事故発生水路の航行規則

事故発生水路は、1972 年 COLREG 規則の適用水路であり、乗組員の行為は同規則に基づいて判断される。しかし、国内河川航行船甲板部職員の研修には 1972 年 COLREG 規則に関する講習が含まれておらず、また、当局も同規則の習知に関して特別な義務を課していない。したがって、同水路における 1972 年 COLREG 規則の適用については、その妥当性に関して議論の余地が残る。

2.6.2　事故関与船舶

2.6.2.1　高速艇の航行システムの異常、アラーム、及び突然の減速

同船の回頭は同船の意思に反するものであったが、この回頭は、通常航行中に主エンジンの 1 基に突然異常が発生し、それがエンジン回転数の低下を招いたために生じたもので、主エンジンにおけるこのような異常の発生は一般に航海上の危険として知られている。これに関する安全上の問題は、今後さらなる検討と研究を必要とする。

2.6.2.2　外側に張り出していた Yue Guang Zhou Huo 0217 のコンベヤー

Yue Guang Zhou Huo 0217 の全長は 30 メートルであったが、コンベヤーは、船首部で固定されて移動不可能な状態のまま、全長の二分の一に相当する 15 メートルの長さにわたって船外に張り出していた。こうしたコンベヤーは、夜間航行の場合、特に国内河川の航行時に航行船舶間の離隔距離が短いときなどは、コンベヤーが視認できないために隠れた危険要素となっている。まだ予備的な統計に過ぎないが、2008 年と 2009 年の 2 年間だけでも、コンベヤーによる同様の事故が 13 件発生している。

2.6.2.3　事故発生水路の速度制限

事故発生時、広州市フー・リアン・ガン水道には正規の速度制限はなかった。

2.6.2.4　高速艇の VDR 装置

高速旅客艇 San Bu は VDR を搭載していなかったが、搭載を義務付ける規則もまた存在していない。この事実は、事故後調査を実施する上で大きな障害となる。

2.7　勧告

San Bu の運航者及び管理者に対して、船内での安全管理手順の遵守を徹底させるため、ビデオ監視システムを搭載すると同時に、甲板部職員の船内業務を定期的に検査することを勧告する。

管轄海上安全監督局に対して、高速旅客艇に VDR の搭載を義務付けること、衝突危険を最小限に抑えるために国内河川の貨物船にコンベヤーの再設計を義務付けること、ならびに、ウォータージェットにおける突発的異常の発生及び同異常の発生が高速旅客艇の安全に及ぼす影響に関して調査及び研究を実施することを勧告する。

管轄海上安全監督局に対して、フー・リアン・ガン水道において速度制限を実施すること、及び、国内河川航行船の甲板部職員を対象にした研修に 1972 年 COLREG 規則に関する研修を含めることを勧告する。

（中華人民共和国香港特別行政区）

報告 1

「2007 年 12 月 7 日に発生した香港籍船 Hebei Spirit と韓国籍クレーン・バージ Samsung No. 1 との衝突に関する調査報告書

以下については、報告書の主要な部分を抜粋して記載したが、詳細については、資料「東アジア各国等の船舶事故調査報告書」を参照されたい。

1. 概要

1.1 2007 年 12 月 7 日 07 時 06 分頃、韓国大山（Daesan）近海の北緯 36 度 52.30 分東経 126 度 03.1 分の地点において、クレーン・バージ Samsung No.1 と香港籍超大型タンカー（VLCC）Hebei Spirit が衝突した。事故当時、クレーン・バージは、タグボート Samho T-3 と Samsung T-5 に船尾を曳かせて航行中であった。バージのもう一方の船端には、小型アンカーボート Samsung A-1 が随伴していた。天候は不良と報告されていた。

1.2 Hebei Spirit は 263,541 トンの原油を搭載していた。事故当時、同船は、大山船舶航行情報センター（VTIS）の指示に従い、指示された大山沖の停泊場所に着錨して荷揚げの待機中であった。衝突の発生前、タグ船団は、悪天候のためにクレーン・バージのコントロールを失い、Hebei Spirit の方向に流されていた。クレーン・バージが Hebei Spirit の船首部を通過して同船に接近した時、クレーン・バージの曳航索の一つが分断された。その結果、クレーン・バージは VLCC の左舷側第 1、第 3 及び第 5 の各貨物油タンクに衝突し、付近の海域に重大な油濁を発生させた。

1.3 Hebei Spirit は、油の流出を抑えるため、直ちに汚染防止措置を実施した。乗組員は、貨物油を破孔したタンクから中央タンクと右舷タンクに移送すると共に、流出量を減少させるための措置として、破孔部に衝突マットを装着した。また、同時に、流出油の拡散を防止するため、オイル・フェンスの設置を行った。しかし、それらの措置にもかかわらず、推定約 10,900 トンの貨物油が海上に流出する結果となった。

1.4　調査の結果、すでに悪天候が予想されていた中で曳航の強行を決断したことが、本事故の主たる寄与要因であることが判明した。加えて、悪天候下で曳航船団が制御不能に陥ったこと、並びに曳航船の船長から VTIS 及び事故海域内の他船への通知が遅延したことが、その他の事故原因として挙げられる。

3.　証拠の出所

3.1　Hebei Spirit - 船長、一等航海士、及びその他乗組員

3.2　Hebei Spirit の代理人弁護士及び運航会社 - 「Ince & Co. 国際法律事務所」及び"V. Ships"

3.3　韓国海洋安全審判院（KMST: Korean Maritime Safety Tribunal）

3.4　韓国海洋安全審判院（KMST）及び Hebei Spirit 代理人弁護士の協力を得て、Samsung No. 1 に関する情報を入手した。大山での調査では、Samsung No. 1 及び事故に関与した 3 隻のタグボートの各乗組員はいずれも韓国警察に拘束されていたため、調査官はこれらの乗組員に接触することはできなかった。

6.　結論

6.1　2007 年 12 月 7 日 07 時 06 分頃、韓国大山（Daesan）近海の北緯 36 度 52.30 分東経 126 度 03.1 分の地点において、クレーン・バージ Samsung No.1 と香港籍船 Hebei Spirit が衝突した。事故当時、クレーン・バージは、タグボート Samho T-3 と SamsungT-5 に船尾を曳かせて航行中であった。天候は不良と報告されていた。

6.2　Hebei Spirit は 263,541 トンの原油を搭載していた。事故当時、同船は大山沖に着錨して荷揚げの待機中であった。事故の直前、タグ船団が Hebei Spirit の前方を右舷方向から左舷方向に横切る形で通過した。タグの通過後、曳航索が分断されてクレーン・バージが Hebei Spirit の方向に流された。その結果、クレーン・バージはタンカーの左舷船首部に接触し、Hebei Spirit の左舷側第 1、第 3 及び第 5 貨物油タンクが破孔して、付近の海域に重大な油濁を発生させた。

6.3　Hebei Spirit は、油の流出を抑えるため、直ちに汚染防止措置を実施した。乗組員は、流出量を減少させるため、貨物油を破孔したタンクから中央タンクに移送すると共に、破孔部に衝突マットを装着した。また、流出油の拡散防止措置としてオイル・フェンスの設置を行った。流出した油の量は、約 10,900 トンと推定される。

6.4　調査の結果、すでに悪天候が予想されていた中で曳航の強行を決断したことが、本事故の主たる寄与要因であることが判明した。船団の曳航能力は、航海中の天候の悪条件を乗り切るには不十分であった。VTIS 及び近隣他船への通知が遅延したことにより、Hebei Spirit は衝突回避措置を講じるための必要時間を十分に取ることができなかった。クレーン・バージはコントロール不能な状態に陥り、Hebei Spirit に衝突した。

6.5　時化状態の中で加速したために、新たに発生した余分な応力によって曳航索が分断された。事故当時、中古のクレーン用動索が曳航索として使用されていたことが判明している。その中古クレーン用動索は、良好な状態で使用しなければ曳航索としては不適当であった可能性があり、これが事故を招く原因になった。

6.6　VTIS は、2007 年 12 月 7 日 06 時 22 分、クレーン・バージが Hebei Spirit の船首から約 0.35 海里の地点に達した時点で、Hebei Spirit に抜錨するよう勧告した。クレーン・バージがきわめて近距離まで接近していたことを考えれば、その重大時点で抜錨を断念した船長の決断は正しかったと思われる。

6.7　Hebei Spirit は、事故後、損傷タンク内の貨物油を他のタンクに移送すると同時に、損傷タンクの側面に衝突マットを固着させるなど、汚染規模の拡大を防ぐための努力を行った。

6.8　同時に、Hebei Spirit の船長は、同船を右舷側に傾斜させることによって損傷貨物油タンク内の油の水位を下げるため、右舷バラストタンクへの意図的な注水を実施した。これらの対策措置は、油の流出量を抑制する上で一定の効果があったものと思われる。事故発生後に同船の船長及び乗組員が行った行動

は、同船の船内油濁防止緊急対策計画に定められた規定に照らして、十分妥当な行動であったと考えられる。

7. 勧告

7.1　本報告書のコピーを、Hebei Spirit の船長及び管理会社に送付すること。管理会社及び船長は、衝突の前後に同船が取った行動が適切であったことを確信して然るべきである。

7.2　本報告書のコピーを、韓国海洋安全審判院及びクレーン・バージ Samsung No. 1 の所有者である三星重工業株式会社に送付し、本調査報告書に記載された関連諸問題について検討を行うことを要請すること。

8. 反論等の提示

8.1　海事局は、事故報告書に特定の個人または組織の行為に関する批判的な記述を記載する場合、報告書の草案のコピーをその個人または組織に送付し、記載された批判への反論あるいは調査官がまだ入手していない新しい証拠を提示するなどの機会を与えることを局の方針としている。

8.2　本報告書の草案に対しては、Hebei Spirit の管理会社、韓国海洋安全審判院、及び三星重工業株式会社から、それぞれの主張が提起された。調査官は、それらの見解を検討の上、適宜必要に応じて報告書草案の修正を行った。本報告書内に反映されていない主張等に関しては、関係当事者に対して別途個別に対応した。

報告 2

「2009 年 11 月 14 日に大韓民国済州道の南東約 72 海里の地点で発生した香港籍貨物船 Joshu Maru と大韓民国漁船 No.3 Dae Kyung との衝突に関する調査報告書

以下については、報告書の主要な部分を抜粋して記載したが、詳細については、資料「東アジア各国等の船舶事故調査報告書」を参照されたい。

1. 概要

1.1 2009 年 11 月 14 日現地時間 21 時 47 分頃、大韓民国済州道（済州島）西帰浦（ソギッポ）の南東約 72 海里に位置するほぼ北緯 32 度 13.7 分東経 127 度 21.3 分の地点において、香港籍一般貨物船 Joshu Maru が、大韓民国漁船 No.3 Dae Kyung と衝突した。

1.2 事故当時、天候は曇りで、視界は約 3 海里から 6 海里、約 7 から 6 のスケールの風が北西ないし西方向に吹いており、海面は波がやや高く、高いうねりを伴っていた。

1.3 この衝突によって No.3 Dae Kyung は浸水し、半潜没状態となった後、翌日沈没した。総員 9 名の乗組員のうち、7 名の命が失われた（死亡者 4 名、行方不明者 3 名）。残りの 2 名は Joshu Maru の乗組員によって救出された後、治療のため韓国沿岸警備隊によって西帰浦市内の病院に移送された。一方、Joshu Maru 側では、塗装に若干の傷が生じたほか、船首及び船首部左舷側に僅かながら凹みが生じた。

1.4 調査の結果、以下の寄与要因が判明した。

(i) Joshu Maru の三等航海士は、COLREGS[1] 第 7 規則、第 8 規則及び第 15 規則を遵守していなかった。不十分なレーダー情報に基づき、6 海里レンジと 3 海里レンジで船首部右舷前方約 20 度の方角に No.3 Dae Kyung の灯り（マスト灯）を認めた三等航海士は、それぞれのレンジで左舷方向への小刻みな変針を

[1]COLREGS - 1972 年「海上における衝突予防のための国際規則」及び同修正規則

返すことによって、自船を No.3 Dae Kyung から遠ざけようとした。その後、同三等航海士は、No.3 Dae Kyung の動きが危惧すべき状況に近づいているにもかかわらず、船長への連絡を行わなかった。同人は、さらに 1.5 海里レンジと 0.5 海里レンジで、それぞれ船首部右舷前方約 20 度と約 10 度の方角に No.3 Dae Kyung の赤色灯（左舷灯）を認めた時点でも（横切り関係）、No.3 Dae Kyung との衝突の回避に必要な避航行動を行うことなく左舷への緩慢な変針を続け、その後取り舵を一杯に切ったが結局衝突に至ることとなった。

(ii)　No.3 Dae Kyung の船橋チームは、COLREG 第 5 規則を遵守していなかった。同船橋チームは、適切かつ効果的な見張りの維持を怠ったため、衝突の瞬間まで Joshu Maru の存在に気付かなかった。

3.　証拠の出所

3.1　Joshu Maru 船長、船橋当直者及び船員、船舶管理会社

3.2　No.3 Dae Kyung の生存者である船長及び調理員

3.3　韓国（木浦）海洋安全審判院、大韓民国

3.4　韓国（西帰浦）沿岸警備隊、大韓民国

6.　結論

6.1　2009 年 11 月 14 日現地時間 21 時 47 分頃、大韓民国済州道西帰浦（ソギッポ）の南東約 72 海里に位置するほぼ北緯 32 度 13.70 分東経 127 度 21.28 分の地点において、香港籍一般貨物船 Joshu Maru が、大韓民国漁船 No.3 Dae Kyung と衝突した。

6.2　事故当時、天候は曇りで、視界は約 3 海里から 6 海里、約 7 から 6 のスケールの風が北西ないし西方向に吹いており、海面は波がやや高く、高いうねりを伴っていた。

6.3　この衝突によって No.3 Dae Kyung は浸水し、半潜没状態となった後、翌日沈没した。総員 9 名の乗組員のうち、7 名の命が失われた（死亡者 4 名、行方不明者 3 名）。残りの 2 名、すなわち船長及び調理員は Joshu Maru の乗組員によって救出された後、治療のため韓国沿岸警備隊によって西帰浦市内の病院に

移送された。一方、Joshu Maru 側では、塗装に若干の傷が生じたほか、船首及び船首部左舷側に僅かながら凹みが生じた。

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(ii) No.3 Dae Kyung の船橋チームは、COLREG 第 5 規則を遵守していなかった。同船橋チームは、適切かつ効果的な見張りの維持を怠ったため、衝突の瞬間まで Joshu Maru の存在に気付かなかった。

7.　勧告

7.1　本報告書のコピーを、韓国（木浦）海洋安全審判院及び韓国（西帰浦）沿岸警備隊に送付すること。

7.2　本報告書のコピーを、Joshu Maru の所有者／管理会社、船長及び三等航海士に送付すること。

7.3　本報告書のコピーを、No.3 Dae Kyung の所有者／船長に送付すること。

7.4　Joshu Maru の所有者及び管理会社に対して以下の勧告を行う。

● 傘下船舶の各船長及び各職員に対し、本報告書に記載した調査事実について各自の認識を促すと同時に以下を確実に実行させるための通達を示達すること。

- COLREGS 規則、特に第 7、第 8 及び第 15 規則の厳守

- 衝突回避行動におけるレーダー／ARPA 装置及びそれらの装置から得られた情報の適正な使用

● 傘下船舶の各船長及び各職員に対し、当直職員が船長への電話連絡を行わなければならない状況が生じた場合の指示事項及び指針を明確にすること。

● 以下に関し、船橋当直者の意識と習熟を促すための指導及び研修を強化すること。

- 衝突回避行動において自船の速力及び／または推進力を調整する必要があると判断される場合は、その実行にあたり、船橋内の主機関及び推進機の各制御システムを正しい方法で使用しなければならない。

- 本船の構造上、船長室は上甲板上に位置するため、船長が自室を出て航海船橋に到着するまでには 20 秒から 30 秒の時間を要することから、危険な状況が生じた場合、船長の応援を求めるときは、早い時点で船長に連絡を入れる必要がある。

● 本船に重大な事故が生じた場合の VDR データの適切な保存／バックアップ手順を定めると共に、船橋当直者にその手順を周知させること。

7.5　Joshu Maru の船長は、特に下級職員及び新任職員に重点を置き、7.4 の勧告事項を船上において有効に実施すること。

7.6　No.3 Dae Kyung の所有者は、同船の船長及び乗組員に、衝突回避行動における COLREG 規則の遵守、とりわけ第 5 規則の遵守を徹底させること。

8. 所見の提示

8.1　海事局は、事故報告書に特定の個人または組織の行為に関する記述を記載する場合、報告書の草案のコピーをその個人または組織に送付し、記載内容について所見を提示する機会を与えることを局の方針としている。

8.2　本報告書の草案は、以下の関係者に送付された。

- Joshu Maru の所有者／管理会社、船長及び三等航海士
- No.3 Dae Kyung の所有者／船長
- 韓国（木浦）海洋安全審判院及び韓国（西帰浦）沿岸警備隊

8.3　上記 8.2.の関係者から、所見の提示はなかった。

インドネシア共和国

「2010年3月6日にインドネシア共和国西セレベス海ランガス岬西方27海里の地点で沈没した一般貨物船アマナ・ガッパ（MV. Ammana Gappa）に関する調査

⑴ 概要

2010年3月7日、NTSCは、海運総局の中央管制コーディネーション・オペレーション（Puskodalops）から事故の通報を受けた。同通報に基づき、NTSCは、生存者の救出先であるマカサール（Makassar）港に調査チームを派遣した。調査チームは、すべての必要データを収集し、乗組員及びレスキュー隊員からの聞き取り調査を行った。

調査官は、事故の原因を特定するため、収集したデータと情報に基づいて、論理シミュレーション等、可能なシミュレーションをすべて実施した。

⑵ 事実情報

アマナ・ガッパ（IMO 番号 7707695）は、1977 年にドイツのフスマー造船所（Hussumer schiffswerft LTD）で建造されたインドネシア籍の荷役装置付一般貨物船で、船級はインドネシア船級協会（BKI）から取得していた。

アマナ・ガッパは、インドネシアの PT. Juli Rahayu が所有し、運航する船舶で、全長 91.5 m、幅 14.2 m、船体の深さは 8.6 m であった。夏季喫水 6.7 m における載貨重量トン数は 4084 トンである。

同船は、船楼の前方に 44.4 m のロングハッチ貨物層 1 層を配置していた。また、同船は、貨物の荷役用として、ビームクレーン 3 基を船体中央部と船首楼に配備していた。

同船の推進機関は、Deutz K.H.D 非可逆式 4 ストローク単動ディーゼルエンジンで、出力は 4000 馬力／回転数 600 rpm であった。同エンジンは、設計上、固定ピッチプロペラ 1 基の推進によって、約 11 ノットの航海速度を出すことが可能である。しかし、喫水が深くなっていることと、主機関の状態が設計時とは異なっていることから、満載喫水時における最大速度は、回転数 195 rpm で 6 ノットから 7 ノットのレベルが精一杯であった。主機関のパワー・トランスミッションはアンカー・バー型で、プロペラ軸に直接動力が伝達される。

また、補助動力機関として、200 馬力エンジン（DEUTZ K.H.D BF6M716）1 基と、313 馬力エンジン（三菱 8DC9-TL）2 基が装備されていた。

事故当時、アマナ・ガッパには 22 名の乗組員が乗船していた。乗組員は全員インドネシア人で、いずれも、同船での勤務に必要な適正な資格を具備していた。船長は、航海経験 29 年のキャリアの持ち主で、インドネシアの 3 級船長免許を所持していた。同船長がアマナ・ガッパ船長の任務に就いたのは、事故の約 4 カ月前であった。

一等航海士は、4 級船長免許を所持し、5 年の航海経験があった。一等航海士は、すでに事故の約 19 カ月前に同船の勤務に就いていた。機関長は、海上勤務 30 年の経験者で、インドネシア 3 級機関士の免許を所持していた。

事故発生時、アマナ・ガッパは、3688 トンの肥料（73.760 袋）を積載して、東カリマンタンのロクチュアン（Loktuan）港から南セレベス海のマカサール港に向かっていた。積荷の積み込みにあたっては、積荷保険会社が事前に貨物倉の検査を行っており、検査の結果は良好であった。

⑶ 事故の状況

2010 年 3 月 4 日 15 時 00 分、アマナ・ガッパは、東カリマンタン州ボンタンのロクチュアン港を出港し、南セレベスのマカサール港に向かった。同船の喫水は、船尾喫水 6.6 m、船首喫水 6.0 m、速度は約 5 ノットから 6 ノットであった。

2010 年 3 月 6 日 04 時 00 分、同船は、西セレベス海ランガス岬の約 30 海里沖合に到達した。

同日 04 時 15 分、当直士官であった一等航海士は、同船が揺れるのを感じた。一等航海士は、座礁または未確認物体との衝突を疑って本船の位置の確認を行い、状況を船長に報告した。この報告に基づき、船長は、一等航海士、操舵員及び IR に本船の状態の点検を命じた。点検の結果、貨物倉に海水が浸水し、船首側が 30 センチほど海水に浸かっているのがわかった。甲板長が測深管を使用して両舷の 1 番水バラスト・タンクを調べたところ、右舷側の水バラスト・タンクでは浸水が 100 cm に達していることが判明した。

04 時 30 分、同船は、右舷に約 5 度傾斜した。船長は、機関部の乗組員に 1 番水バラスト・タンク内の海水の排水を命じた。当直機関士はバラスト・ポ

ンプを作動させた。他の乗組員は、右舷側のポンプ 2 基を使用して貨物倉内の海水を汲み出すよう命じられた。

05 時 00 分、船長は、当直機関士の補助にあたっていた機関長に、主機関を停止させるよう命じた。理由は、本船の動きが浸水を加速させると考えたためである。補助機関 1 基は、船内電力を維持するために運転が継続された。

07 時 30 分、船長は二等航海士に、チャネル 16 を使用して遭難信号を送信するよう命じた。08 時 00 分、本船の傾斜は 10 度に達した。乗組員は、依然として貨物倉とバラスト・タンクの排水作業を続けていた。08 時 20 分、マカサール港との間で無線通信が通じた。

11 時 00 分、本船は 25 度まで傾斜した。 IR が再度水バラスト・タンクを調べたところ、浸水は測深管で 200 cm のレベルに達していた。この状況に至り、船長は総員退船を命じた。乗組員は ILR（膨張式救命いかだ）を 2 基使用しようとしたが、膨張に成功したのは 1 基のみであった。EPIRB（非常用位置指示無線標識装置）を作動させ、乗組員は全員が無事 ILR に乗り移ることができた。本船の傾斜は、悪化する一方であった。

12 時 00 分、遭難者たちは、本船が北緯 02 度 40 分 63 秒、東経 118 度 22 分 65 秒、水深 2000m の地点で沈没するのを目撃した。同船は、船首部から沈没した。船長は、メイデイ信号によって本船の最終位置を確認した。

15 時 00 分、事故地点付近を航行中であったネプチュヌス（MV. Neptunus）が、遭難者からの遭難信号を受信した。ネプチュヌスの船長は、遭難者の救出に向かうべく、進路の変更を命じた。

15 時 50 分、ネプチュヌスは、遭難者の漂流地点に到着し、その救出に当たった。16 時 30 分、遭難者は全員、無事ネプチュヌスに移乗することができた。

⑷ 分析

アマナ・ガッパの直近のドック入れは、2008 年 2 月に、船舶検査官と BKI 船級協会検査員の立ち会いの下に実施されていた。また、BKI の船級検査は、2009 年 4 月に洋上年次検査が実施され、同船の状態は「船級を維持」していると判定されていた。積荷の積み込みに際しては、積荷の検査員が貨物倉の検査を行い、船倉は良好な状態にあることを確認していた。

天候及び海面の状態は、マカサール港を出港した時点から事故発生時まで、全航程を通じて良好であった。同船の事故現場は、沿岸から 27 海里離れた水深 2000m の深海域であった。6 ノットで航行する船舶に、何かの浮遊物が衝突して船体の前部を損傷させるといった状況は、きわめて考えにくい。

当直航海士は、本船に浮遊物が衝突した疑いがあったにもかかわらず、その正体についての調査を即座に行わなかった。船長は、本船を沿岸の安全な場所に避難させる努力を行う代わりに、機関の停止を命じた。船長は、浸水口を探し出し、セメントボックスを作って海水の流入を止めるなどの、緊急事態における必要な措置を下命しなかった。船内の書類（事故調査に必要なもの）は、乗組員の免許状のほかは、すべて本船と共に消失した。乗組員は全員生存し、良好な健康状態で救出された。

⑸ 判明した事実

アマナ・ガッパの沈没は、貨物倉と水バラスト・タンクに海水が浸水したことによって浮力を失ったことが原因である。

⑹ 事故の要因

・ 船長は、本船を近くの沿岸の安全な場所に避難させる代わりに、機関の停止を命じた。
・ 乗組員が行った被害対策は、もっぱら侵入した海水の汲み出し作業のみに終始したが、効果は上がっていなかった。
・ 船長は、浸水口を探し出して海水の流入を止めさせるなどの、緊急時における必要措置を講じなかった。
・ 乗組員は本船の現状について習熟が不十分で、緊急事態に対して適切に対応することができなかった。
・ その他の安全上の要因

避難の手順は効率に欠け、乗組員は直接的な支援を十分に得ることができなかった。そのため、遭難者は、生存の確証がないままに、約 3 時間にわたって海上の漂流を余儀なくされた。

⑺ 関係者への提言

・規制当局に対して

・船舶の運航に関して、技術面での監督を強化すること。
・船舶運航者による管理責任者（DPA）の任命に関する監督の改善
・遭難船舶に対する救援行動の改善（及び直接行動の指揮）

・船舶運航者に対して
・運航中の船舶、特に遭難船舶の動向に関する監視の改善
・ISM コードの適切な遵守、特に緊急事態への対応や管理責任者（DPA）の任命
・各乗組員の乗務船舶についての習熟度の向上及び緊急時の対応手順の改善

・乗組員に対して
・万難を排して本船からの退避を試みること。
・退船手順を遵守すること、船内書類を適切な方法で搬出すること。
・緊急事態等に関し、ISM コードを適切な方法で遵守すること。

マレーシア

「ブンガ・ケラナ 3（BUNGA KELANA 3）とウェイリー（MV WAILY）の衝突」

概要

ブンガ・ケラナ 3 は、ビンツル中質原油及びビンツル天然コンデンセート油を積載して、ビンツルからマラッカに向けて航行していた。2010 年 5 月 25 日、同船はシンガポール海峡の警戒海域（ジョホールの南側）を通過中であった。現地時間の午前 6 時 04 分頃、ブンガ・ケラナ 3 は、インドのヴィシャカパトナム港から中国新疆港に向けて航行中であったウェイリーと衝突した。

この衝突により、ブンガ・ケラナ 3 の左舷 4 番貨物油タンク（4(P)COT）が破損し、約 4500MT のビンツル原油が流出した。

事故の原因

・ウェイリーは、COLREGS 規則の遵守違反を犯し、適切な避航行動を取らなかった。
・状況認識の欠如により、ブンガ・ケラナ 3 の回避行動が不十分であった。
・ヒューマンファクター - 航行支援設備を効果的に利用しなかった。

調査方法

・乗組員、代理店、管理責任者（DPA）、事務所スタッフからの聞き取り調査
・VTS AIS の記録、ブンガ・ケラナ 3 の VDR 記録等の回収／参照
・VTIS EAST の通信記録を入手するための、シンガポール MPA（海事港湾庁）との連絡
・両船からの、その他記録／証拠類の収集

国際協力

・VTIS EAST の通信記録を入手するための、シンガポール MPA との連絡

フィリピン共和国

「2008年11月12日にイロイロ州コンセプションのBarangay Bangonon付近で発生したM/BCA "ROLIV"の転覆事故

以下については、報告書の主要な部分を抜粋して記載したが、詳細については、資料「東アジア各国等の船舶事故調査報告書」を参照されたい。

I. 権限

本調査委員会は、海事産業局（MARINA: Maritime Industry Authority）とフィリピン沿岸警備隊（PCG）との間で取り交わされた2005年9月14日付の合意書、ならびに共和国法律第5173号（フィリピン沿岸警備隊の創設ならびにその権能及び機能及び必要資金の配賦ならびにその他目的等に関する法律）及び1974年改正沿岸警備隊法として知られる大統領令第601号の基づく同法律の修正法に則り、本事案に関する調査の権限及び管轄権を掌握する。

IV. 審理

本調査委員会は、本調査委員会が行う行政調査及びその裁決に関し、証拠規則の厳密な適用を受けない。ただし、裁判所規則に関しては、実務上の必要に応じて、類推により、または補充的性格の規則として、本調査委員会への適用を受容する。

本調査委員会による本事案の審理は、公開の公聴会を通じて行われた。本調査委員会は、本船の登録船主及び船長に対し、2008年11月12日に、本調査委員会において証言することを命じた。本調査委員会は、証言の実施に先立って、同登録船主と同船長に、それぞれ自らの意思で弁護士を選任してその支援を得る権利を有する旨を伝えた。しかし、同登録船主及び同船長は、双方共、弁護士を伴わずに単独で証言することを希望した。本調査委員会は、各自が行う証言の重要性とその影響の大きさについて明確な説明を行った上で、本事案の審理においては弁護士を起用してその支援を求めるよう両名に要請した。本調査委員会は、そのための猶予措置として、口頭証言の実施日を2008年11月24日に延期した。あいにく、2008年11月24日の公聴会は、本調査委員会メンバーのスケジュールに想定外の不都合が生じたために、2008年12月12日まで再延期となった。かような経緯にもかかわらず、2008年12月12日当日、公聴会

への出席のために出頭した登録船主と船長は、依然として弁護士を伴っていなかった。本調査委員会は、再度、説明の趣旨を明確に理解してもらうために両人の方言を用いて、両人には弁護士を起用する権利が与えられていること、及び、両人が行った証言は、本調査委員会により、または裁判所において、両人にとって有利な形で採用されることがあれば、不利な形で採用されることもあり得る旨の説明を行った。これに対し、両人は、説明の趣旨は理解していると明言した。本調査委員会は、両人には弁護士の起用に関してすでに十分な時間的猶予を与えていることから、両人に口頭証言を求めるにあたって然るべき時機が到来したものと認めた。

上記 2 名のほかに、本調査委員会は、本事案に関係する事実関係及び法律上の問題点を明らかにする上で必要な協力と重要情報の提供を得るため、他の証人及び参考人の召致を行った。

V. 問題点

1. M/BCA "ROLIV"は何が原因で転覆したのか。
2. M/BCA "ROLIV"の登録船主及び／または船長の側に過失があったか、なかったか。
3. M/BCA "ROLIV"の登録船主及び／または船長に対し、行政上、転覆の責任を問うことができるか。

VII. 判明した事実

A. 本調査委員会は、M/BCA "ROLIV"は何が原因で沈没したのかという第 1 の問題点について、以下の要因が関与したものと断定した。

1. 主原因

ブラック法律辞典（ミネソタ州セントポール West Publishing Co.社刊）第 8 版特装版は、「主原因」を以下のように定義している。

「有効な中断原因が介在しない、自然で連続的な因果関係にあって、被害発生の素因をなし、かつ、その存在がなければ被害が発生しなかったとみなされる原因」（Wisniewski 対 Great Atlantic and Pac. Tea Co.事件 226 Pa.Super. 574, 323 A.2d 744, 748）。××× 被害、あるいは損害が発生した場合に、特定の

行為、または不作為が、その被害または損害の発生に本質的な役割を果たしており、またはその発生原因となっており、かつ、その被害または損害が、かかる行為または不作為の直接的結果として、または合理的に予見し得る結果として生じたものであることが当該事案の証拠から明らかなときは、かかる行為または不作為が当該被害または当該損害の主原因となる。

本事案の場合、本調査委員会は、M/BCA "ROLIV" の転覆は同船が耐航性を具備していなかったという明白な事実が主原因となって生じたものであると断定した。船舶の耐航性の意味を明らかにするため、再度上記ブラック法律辞典の定義を引用する。同辞典によれば、「耐航性」とは、

「船舶がその航海中に通常遭遇すると考えられる風、波、及びその他天候条件によってもたらされる通常の応力に耐抗し得る能力」を意味する（Miles 対 Royal Indem. Co. 事件 Tex. Civ.App., 589 S.W.2d 725, 729）。「耐航性」という言葉は、船舶を形容する場合、本船が意図した航海に必要な船体構造、準備体制、乗組員、設備、及び糧食を備えていることを意味する（Robichaux 対 Kerr McGee Oil Industries 事件 D.C.La., 317 F.Supp. 587, 591）。船舶が耐航性を有すると認められるためには、一般に、意図した航海を安全に実行する上で必要な、十分な強度と、適切な装置を装備していなければならない（Texaco 対 Universal Marine, Inc. 事件 D.C.La, 400 F.Supp. 311, 320）。

M/CBA "ROLIV" は、本調査委員会が入手したあらゆる証拠に照らして、上記定義による耐航性を欠いていたことが明白である。先ず第一に、同船は、運航上必要なライセンス、証明書等の法定書類を完備していなかった。法定書類を完備していないという事実は、必然的に、同船が、航海適性の判定に必要な各種検査及び査定を実施していないことを意味する。加えて、同船は、必要な員数の適格な職員を適正に配乗していなかった。M/CBA "ROLIV" には、船長と船用ディーゼル機関士を兼ねた者 1 名が、いずれの資格も持たないまま乗務しているのみであった。
さらに、M/CBA "ROLIV" の乗客が本調査委員会に対して行った証言によれば、同船は救命胴衣を装備していなかった。このことから、同船には航海に必要な装備が欠如していたことが明らかである。

最後に、M/CBA "ROLIV" における耐航性の欠如を決定付けた最終的要因は、同船のエンジンの故障である。同船の転覆現場は、予定した目的地の海岸から約 200 メートルの地点であった。もしエンジンが故障していなければ、自力航行が不可能な状態で海上で立ち往生することはなかったと思われる。また、極端に遅い速度で他船に曳かれる必要もなかったであろう。さすれば、同船は、残りの 200 メートルを自力で航行することができ、風が強まり、波が高まる前に、目的地に到達することができたはずである。

2. 直接原因

上記ブラック法律辞典では、「直接原因」を以下のように定義している。

「一定の結果に至る一連の原因の中で時系列的に最後の原因であって、他の原因の介在なくして単独で、その結果または事象を直接発生させる原因となるもの」×××

本調査委員会は、M/CBA "ROLIV" の耐航性の不備に関する上記の論旨にかかわらず、「クインタ（Quinta）」とよばれる熱帯低気圧によってもたらされた強風と高波が同船を強打したことが、同船を転覆に至らしめる直接の原因になったという事実を無視することはできない。しかしながら、そうした事態は、M/CBA "ROLIV" に耐航性が具備されてさえすれば、発生せずに済んだはずのものである。

B. M/BCA "ROLIV"の登録船主及び船長の側に過失があったか、なかったか。

この点に関しては、本調査委員会は、過失があったと判断した。本調査委員会は、登録船主及び船長の双方に、重過失があったものと断定した。上記ブラック法律辞典では、「重過失」を以下のように定義している。

「他の者の生命または財産に及ぼす影響を未必の故意をもって無視して、明白なる義務の履行を意図的に怠ること」

登録船主による重過失は、同人が、M/CBA "ROLIV" の運航に必要なライセンス、証明書等の取得を、自らの意思で故意に怠った事実によって明らかである。

また、同登録船主は、M/CBA "ROLIV" を運航するために必要な適正な数の適格な職員を適正に配乗する義務にも違反していた。さらに、同船は多数の犠牲者を発生させたが、その原因は、同登録船主が M/CBA "ROLIV" の乗客用の救命胴衣を装備していなかったことに直接起因するものであると結論される。

他方、船長については、同人が必要なライセンス及び資格を持たないまま船長兼船用ディーゼル機関士として M/BCA "ROLIV" の運航に従事することを承諾した時点で重過失を犯したものと本調査委員会は断定した。加えて、同船長は、目的地に向けてコンセプション（Conception）のバゴンゴン（Bagongon）を出港した時点ですでに熱帯低気圧の発生を承知していたにもかかわらず、それを無視して航海を継続した。

C. M/BCA "ROLIV"の登録船主及び船長の両名に対して、行政上、転覆の責任を問うことができるかという点に関して

上述の論旨に基づき、本調査委員会は、M/BCA "ROLIV"の登録船主及び船長の双方に対して、同船の転覆に関して行政上の責任を問うことができると断定した。

VIII. 勧告

A. MARINA は、M/CBA "ROLIV"の登録船主及び船長が船舶の安全に関する MARINA の方針、規則及び規制に違反したことに対して、然るべき行政罰を両名に科すこと。

B. 司法省の関係担当者は、M/CBA "ROLIV"の登録船主及び船長の両名に然るべき刑事罰を科すこと。

C. PCG は、2008 年 6 月 30 日付通達 06-08 号「荒天下での船舶の航行に関する中間ガイドライン」に基づき、同通達の遵守徹底を図ると同時にその規定を露骨に無視する者を取り締まるための効果的な行政罰を科すこと。

D. MARINA は、すべてのエンジン付きバンカに対し、職員及び一般乗組員の定員、旅客の定員、その他関連データ等、当該バンカが安全に航海できる船

舶であるかどうかを旅客が判断する上で有用な情報を、船体の目につきやすい場所に表示することを義務付けること。

E. PCG 及び MARINA は、すべてのエンジン付きバンカに対し、乗客に苦情が生じた場合、または両機関の方針、規則もしくは規制に関して違反が認められた場合に、乗客が書面または電話によって各機関の担当者に連絡を取ることを可能にするため、両機関のホットラインの番号を記載することを義務付けること。

F. フィリピンが群島国家であることを考えれば、M/CBA "ROLIV" 事件のようなケースは、国内のどこにでも発生する可能性がある。多くのフィリピン人は島部で生活しており、エンジン付きバンカが唯一の輸送手段である場合が少なくない。したがって、MARINA には、乗客及び貨物の輸送を行っているエンジン付きバンカの定期航路を把握する義務がある。よって、MARINA は、同航路を航行するすべての船舶に、運航に必要な証明書、ライセンス等の法定書類の取得を徹底させなければならない。

G. 各地方自治体は、エンジン付きバンカの運航業務を継続的に維持するため、資金提供者を募ってエンジン付きバンカ運航共同組合の設立を促し、その支援を行うこと。

H. MARINA は、上記の共同組合に対し、エンジン付きバンカの運航に必要な法的義務の履行を支援するための一環として、各種料金諸チャージの減免を実施すること。

I. PCG は、PCG と MARINA との間で取り交わされた 2005 年 9 月 14 日付合意書、及び、2005 年 9 月 22 日付 R.A. 9295 号に基づく船舶安全機能の実施に関する PCG-MARINA 間合意書を実行するための指針についての PCG 通達 09-05 号 に基づき、MARINA によって確立された上記の定期航路に、MARINA を支援するための特別支部を設けること。

大韓民国

報告 1

「ジェットフォイル客船 KOBEE Ⅲの支柱の損傷」

事故発生日時：2010 年 3 月 1 日 18 時 05 分

発生地点：釜山の南東 9.3 海里

事故の概要

KOBEE Ⅲは、乗客 205 人を乗せ、2010 年 3 月 1 日 15 時 15 分に福岡港を出港して釜山に向かった。航行中、同船の右舷船首部は、強い波と風の圧力を受け、右舷のピボット・ピンと支柱を固定するボルトが破断した。そのため、同船は、8 時間以上にわたり、韓国沿岸警備隊の船舶によって釜山まで曳航される結果になった。

事故の原因

- 3 月 1 日は、14 時 00 分の時点ですでに暴風雨警報が発令されており、風力 12～16 m/s、波高 2～4 m との予報が伝えられていたが、船長は誤った経験判断に基づいて出港を決行した。
- 固定ボルトの損傷は、本船が時化の中を 35-40 ノットの高速で航行したことによってボルトに過剰な応力が作用した結果損傷に至ったもので、長期間にわたって蓄積された金属疲労が原因と思われる。

調査方法

- 船長、会社の監督責任者、船級協会等からの聞き取り調査
- 証拠の収集
- 事故原因の分析

本船の要目

船名：KOBEE Ⅲ

建造：1977 年 2 月、Boeing Company

G/T：160 ton

L/B/D：23.93/8.53/2.59m
主機関：ガスタービン（2,835kw）2 基
推進機関：ウォータージェット
速力：40-45 ノット（翼走）
本船の航路
港間距離：112 海里
速力 40 ノットで 3 時間の航程
運航回数：1 日 3 航海（3 月－6 月）

事故の概要

- 2010 年 3 月 1 日 15 時 15 分博多港出港
- 2010 年 3 月 1 日、18 時 05 分、ボルト破断
- 2010 年 3 月 2 日 04 時 10 分釜山港到着
- 35-40 ノット

波浪警報

- 風向：北東ないし北
- 風力：14～18m/s
- 波高：2～4m

韓国沿岸警備隊所属船舶により曳航

支柱＆接続ボルト

事故の要因

- 事故当日、09 時 30 分に波浪警報が発令されていたにもかかわらず、船長は誤った経験判断に基づいて博多港からの出港を決行した。 - 同日、船長はすでに釜山と博多の間を 2 回航行していたが、何も異常は生じていなかった。
- KOBEE Ⅲが航行できるのは風力 18m/s、波高 3m までで、それ以上の悪条件下での航行は禁止されていた。

事故の要因

- 船長は、航路から遠くない近隣港である対馬の比田勝に避難できたにもかかわらず、それを行わなかった。
- 支柱は、右舷船首部において、14m/s を超える強い北東の風と 2.5～3.0m の高波により、絶えず強い衝撃にさらされていた。 - ローリング、ピッチング、ヨーイング、サージング等による振動が、支柱を大きく破損させたものと考えられる。
- 船長は、船橋には風速計が装備されていなかったため、目視のみで計測した波高を基準にして「デプス・コントロール・レバー」を操作した。

損傷の原因

- 接続ボルトの損傷は、長期間にわたって蓄積された金属疲労によるものと思われる。
- ボルトは、海面状態が極めて悪い中を 40 ノットを超える高速で航行を続けたことにより、絶えず過剰な応力にさらされていた。

船舶所有者（運航会社）への提言

- 船橋に風速計を装備すること。
- 乗組員に対し、「出航禁止規則」を遵守させるための教育を徹底すること。
- 各船舶の安全管理手順を見直すこと。
- 船級協会への提言
- 船舶検査をより慎重に実施すること

報告 2
「貨物船 Hyundai Continental の爆発事故」

以下については、報告書の主要な部分を抜粋して記載したが、詳細については、資料「東アジア各国等の船舶事故調査報告書」を参照されたい。

概要

一般貨物船 Hyundai Continental は、韓国の光陽（gwangyang）において荷揚げ作業を行っていた。その時、一等航海士及びその他乗組員は、船尾に位置する煙突「A」及び「B」の上で、本船の食糧・備品荷役用として唯一装備されていたプロビジョンクレーンを使用し、プラスチック容器に入った塗料及びシンナーの積み込み作業中であった。

船長は、上記の積み込みが完了した後、貨物の荷揚げ作業中に同積み込み現場の巡視を怠ったために、破損した容器から塗料及びシンナーが漏出していたこと、及び煙突の煤煙と火片がその塗料とシンナーの上に降り懸かっていたことに気付かなかった。

火災は乗組員によって発見され、消火された。

3. 原因

3.1 火災発生場所についての考察

3.1.1 危険性

火災は、煙突に連結した甲板上で発生した。煙突からは、時折、ボイラーやエンジンを発生源とする煤煙や火片などの不完全燃焼物質が噴き出し、同甲板上に落下していた。煙突口から約 18.20m 下方の上甲板でも、落下した不完全燃焼物が確認されていた。煙突の外壁灯からは常に熱が放出されている上、煙突自体、排気の通過によって船内で最も気温が高くなっているため、煙突周辺に可燃物を持ち込むことは禁止されていた。

3.1.2 出入りの便

事故が発生した区画は、周辺の気温が煙突の熱で高温化していた上、ボイラーやエンジンを発生源とする煤煙や火片などの不完全燃焼物質が時折甲板上に落下していた。そのため、船員その他がこの区画に出入りすることはめったに

なかった。また、この区画は、居住区から離れた甲板から出入りする手段も限られ、階段を利用するにも不便な場所に位置していた。したがって、この区画を使用するのは、煙突及び煙突周辺部の修理、またはプロビジョンクレーンのブームの修理を行う場合のみに限られていた。

3.2　塗料の積み込み、及び安全対策に関する配慮

3.2.1　塗料、シンナー等の積み込み

塗料、シンナー等は、可燃性の非常に高い危険物質であるため、火気・高温を伴う物または場所への接触や持ち込みは認められていない。また、船舶管理会社も、塗料及びシンナーを「通常危険」物質に指定し、これらの物質を船内に貯蔵する場合は、安全管理手順に基づいて指定された場所で作業／保管を行うことを定めている。しかし、船長は同規則の遵守を怠り、火災の危険がある不安全な場所に塗料とシンナーを積み込んだ。船長がそれらの塗料及びシンナーの積み込みに際して考えたことは、船内には十分な保管場所がない、本船の本来の作業の妨げになる可能性がある、本船の修理の必要が生じた場合はアクセスしやすい場所に在った方が都合がよい、といったことだけであった。

3.2.2　安全管理の無視

火災事故を発生させることになった現場に塗料及びシンナーを積み込んだ際、積み込み作業の前後に、合計 1,000 個の収納容器について損傷の有無を確認するための検査が十分に行われていなかった。損傷容器からの液の漏出はすでに積み込み作業の時点から始まっていたが、船長はそのことに気付かず、現場の巡視強化を怠った上、積み込んだ材料を保護するために必要な防水材やアスベストによる被覆措置も講じていなかった。唯一、ビニール製のシートが上掛けとして使用されていたが、これは高熱が発生した場合や火片が付着した場合、火災の危険を伴うものであった。

3.3　火災に至る経緯

塗料及びシンナーは、約 2 メートルの高さに積み上げられていた。その上端からわずか 40～60 センチ上方には 220v-60w の電球が設置されており、現場はその光源の熱と煙突の外壁から伝わってくる高熱に曝されていた。そうした条

件下において、煙突から出た煤煙と火片が塗料及びシンナーから漏出した強力な可燃ガスに引火し、火災が発生したものと想定される。

3.4　事故の原因

本火災事故は、安全管理規則の遵守を怠ったことによって発生した。塗料及びシンナーは発火の可能性が非常に高いため、積み込み及び保管は指定された区画内で実施なければならない。本船の船長は、それらの物質の安全管理を怠り、高熱と火炎を伴う煙突の近接甲板においてその積み込みを行った。その結果、煙突の火片が塗料及びシンナーから発生した可燃性のガスに引火し、また、塗料及びシンナーの被覆材がビニールであったことも災いして、最終的に火災を発生させるに至った。

4.　事故の教訓

A.　塗料及びシンナーの取り扱いは、取り扱い及び保管の安全に関する規則に基づいて適正に行わなければならない。

B.　危険物質の移動、積み込み、保管等を行う場合は、保存容器の損傷または容器からの漏出の有無を慎重に点検すると共に、当該現場の巡視を強化しなければならない。

報告 3
「貨物船 Orchid Sun の submersion」

以下については、報告書の主要な部分を抜粋して記載したが、詳細については、資料「東アジア各国等の船舶事故調査報告書」を参照されたい。

概要

貨物船 Orchid Sun（26,046gt、船齢 22 年）は、42,040.8 トンの鉄鉱石を積載し、中国新港（Xingang）を出港してイランのホメイニ港に向かっていた。予定の航路を航行中、同船は左舷船首部に強い波と風の圧力を受け、海水が船内に浸入した。その結果、同船は、2007 年 7 月 12 日 03 時 22 分頃、オマーン国マ

スカットの東方約 107 海里の地点で沈没し、総勢 23 名の乗組員のうち、13 名が死亡または行方不明と推定された。

2.2　事故の原因

Orchid Sun は、検査及び保守の怠慢によって外板部が甚だしく脆弱化していたところに、高さ 5～7 メートルの強い波の直撃を左舷船首部に受けた。そうした状態の中で、同船は 6～7 メートルの対地速度で航行を続けた。結局、老朽化した外板部は波の衝撃に耐えることができずに破損を生じ、1 番貨物倉に大量の海水が浸入する結果となった。

船長は、復原性の計算を行い、本船はたとえ船倉内が完全に浸水したとしても水没することはないと結論したが、計算にあたり、船首喫水が極端に深くなった場合は浸水が他の部位に広がる可能性があることを考慮していなかった。船長は、この計算の結果のみに頼り、本船を放棄するなどの安全措置を講じることを怠った結果、13 名の乗組員が死亡ないしは行方不明となる惨事を招いた。

3.　事故の教訓

A.　船体外板部の検査及び保守を、適切な方法で実施することが求められる。

これまでにも、船体縦強度の低下、過大な剪断応力、損傷時復原性の不足、船体の摩耗または腐食等の原因によって水没したばら積貨物船の事故例が数多く報告されている。それらの船は、遭難信号を発することもできずに沈没した。IMO は、それらの事故の教訓から、ばら積貨物船の復原性及び救難に関する条件を強化すると同時に、ESP（enhanced survey program：検査強化プログラム）を採用して船舶検査の強化を図っている。

Orchid Sun の場合、所定の船舶検査をすべてクリアしていたにもかかわらず、外板部がスケール 7～8 の風力下で強い波の衝撃を受けて損傷し、本船を水没させる原因となった。外板部の隠れた瑕疵を発見することは簡単ではない。検査と保守を怠れば、そうした瑕疵が放置され、何時でも似たような事故が起きる可能性がある。

同様の事故を防止するためには、船体強度の増強、損傷時復原性の強化、外板の効果的厚み測定等の対策を講じることが重要となる。しかし、それ以上に重要なことは、外板の修理時または検査時に以下を同時に履行することである。

(1) 新旧の鉄板を溶接する場合、強度の違いの影響、修理部全体の残留応力、及び接触損傷に起因する強度の低下を考慮すること。(2) 外板部の鉄板を交換する場合、亀裂の検査、塗装されていない水バラスト タンク の定期的検査、及び溶接部の非破壊試験を事前に実施すること。また、上記に伴い、外板部を常に最善の状態に維持するため、外板部の検査及び保守の効果的な実施方法を確立することが必要である。

B.リスク要因を予測する場合、リスクの発生可能性を同時に考慮しなければならない。

船長及び一等航海士の両人は、ビルジ・ラインから流入した海水によって 1 番貨物倉が沈水する危険が生じたことを示す兆候を得ていながら、あるいは浸水検出システムに浸水の発生が表示されていることを承知しながら、状況の即時確認を実行しなかった。両人は、それらの浸水を、悪天候下で長時間航行を続けたためにハッチから流入した浸水であろうといった程度にしか考えなかった。仮に船長または一等航海士が、ビルジ・ラインからの海水の流入を発見した時点で直ちに状況の確認を行っていたとすれば、本事故の結果は異なったものになっていたと考えられる。

また、両人は、復原性の計算を行った際、たとえ 1 番貨物倉が沈水したとしても復原性に問題はないとの計算結果を得た時点で、水没の危険に関してきめ細かい検討を行わなかった。両人が単に流入水量のチェックのみを行いながら航海を継続する間、事態はさらに悪化した。過去の船舶沈没事故でも、乗組員が退船できなかったために多くの犠牲者が発生した事例が数多く報告されている。損傷時復原性等に関する計算は、長い経験等に基づき、本船の安全性に関するさまざまな要素を考慮した上で行われたが、現実には、実際の状況と計算結果との間に大きなかい離が生じた。このような現実に鑑み、リスクを予測するときは、緊急事態が発生した場合に遅滞なく対処活動を行うことができるようにするため、常に最悪の事態を想定した上で予測を立てることが肝要である。

C.　悪天候下で航海を行う場合は、船体への衝撃を最小限に抑える努力を行わなければならない。

Orchid Sun は、船齢 20 年を超えた老齢船である。したがって、同船の船体の全体的強度は脆弱化が進み、他の新しい船と比較して、衝撃によって損傷を

受ける可能性がきわめて高かった。現実に、同船は、悪天候下で航海を続けたために 1 番貨物倉付近の外板に損傷を負い、その結果、本事故を発生させるに至った。

船舶が悪天候下で航行する場合、本船の安全を確保するためには、本船自体に十分な抵抗力が具備されると同時に、各乗組員が風や波に対抗できる操船術を習得していなければならない。航行する船舶が悪天候下で強い波を船首部または船尾部に受けると、海水による甲板の打ち付けや甲板への浸水が生じ、その結果、船体は非常に大きな衝撃負荷を負うことになる。また、航海速力が一定の速度を超えると、上限の振動やピッチングが激しくなるため、波の衝撃はさらに大きくなる。このような場合、操舵力及び復原力の許容範囲内で減速または変針を行って本船の相対運動をコントロールすれば、船体への波の衝撃を緩和することできる。

したがって、悪天候下の航海において船体損傷に起因する海難事故を防止するためには、変針、減速等の操舵技術が船体への衝撃を最小限に抑えるために必要となる。

D. 現場に急行することが、人命救助の最善方法である。

Orchid Sun の沈没時、同船の遭難信号は周辺他船に送信されると同時に、衛星 EPIRB を通じて陸側にも発信された。同信号を受けて、オマーン国陸軍のヘリコプターと周辺の他船が事故現場に急行した。約 2 時間後、事故当時 Orchid Sun から 18 海里付近を航行中であったバハマ籍のセメント運搬船 MegahCement が現場に到着し、遭難した乗組員のうち 7 名を無事に救出した。また、MegahCement に続いて現場に到着したインド籍の原油タンカー MaharshiKrishnatre も 2 名の乗組員を救出した。

救出された 10 名の乗組員のうち、実に 9 名がこの 2 隻によって救出されたという事実は、他船が如何にして迅速に現場に到着するかという点が救助活動の成否の重要なポイントになることを示している。さらに付け加えれば、貨物倉の沈水等の危険が生じた場合、海難救助船が随伴していれば、人命の救助、及び遭難者数の低減にさらに寄与できるものと考える。

２　船舶事故発生件数及び調査件数について

（中華人民共和国香港特別行政区）

Annual Accident Type

Inside Hong Kong Waters

	2005	2006	2007	2008	2009
Collision	200	208	-	163	-
Contact／Allision	39	45	-	43	-
Stranding ／Grounding	29	25	-	18	-
Foundering ／Sinking	32	21	-	27	-
Fire／Explosion	31	30	-	19	-
Capsized／Listing	11	7	-	10	-
Others	26	25	-	43	-

Outside Hong Kong Waters

	2005	2006	2007	2008	2009
Collision	14	25	-	24	-
Contact／Allision	5	7	-	12	-
Stranding ／Grounding	10	15	-	3	-
Foundering ／Sinking	4	3	-	0	-
Fire／Explosion	5	7	-	0	-
Capsized／Listing	0	0	-	0	-
Others	5	6	-	53	-

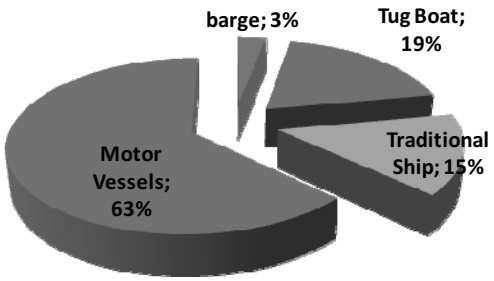
Type of Accidents（2005－2009）5 years

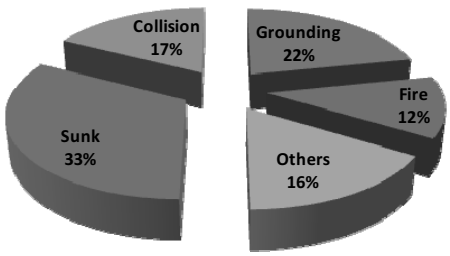
Inside／outside Hong Kong Waters（HKW）

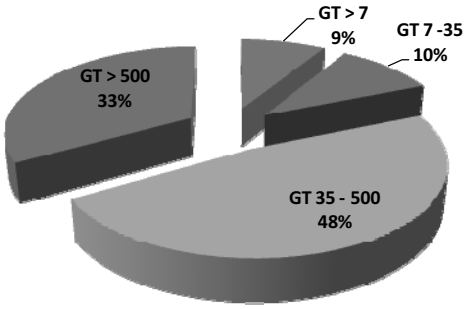
	Inside HKW	Outside HKW
Collision	1,276	83
Contact／Allision	266	30
Stranding ／Grounding	170	52
Foundering ／Sinking	162	26
Fire／Explosion	-	-
Capsized／Listing	62	1
Others	158	25

（インドネシア共和国）

NO.	YEAR	NO. OF ACCIDENT	ACCIDENT CATEGORY					NO. OF CASUALTIES
			SUNK	FIRE	COLLISION	GROUNDING	OTHERS	LOSS OF PERSON /MISSING
1	2007	159	63	27	20	23	26	221
2	2008	137	54	22	15	17	29	83
3	2009	124	41	26	16	19	22	247
4	2010 (SEPT)	92	30	11	16	20	15	145
TOTAL		512	188	86	67	79	92	696







（マレーシア）

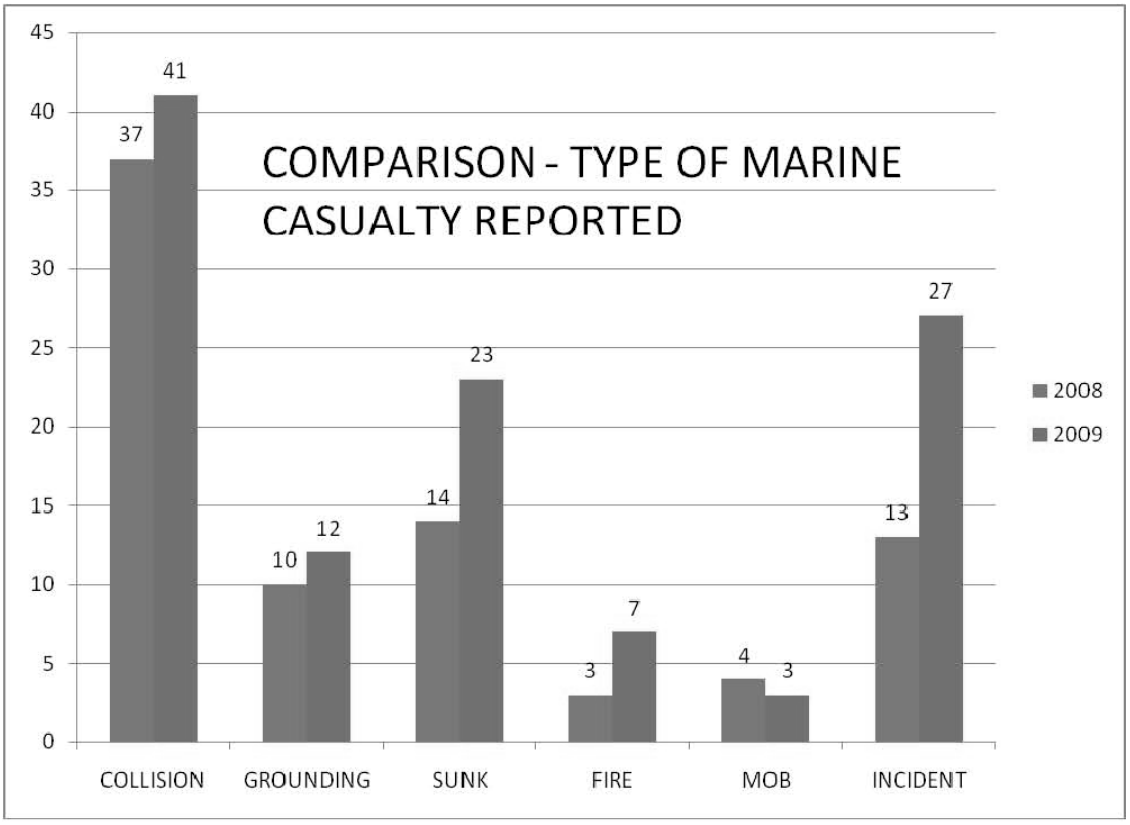
TOTAL NUMBER OF ACCIDENT REPORTED IN MALAYSIA

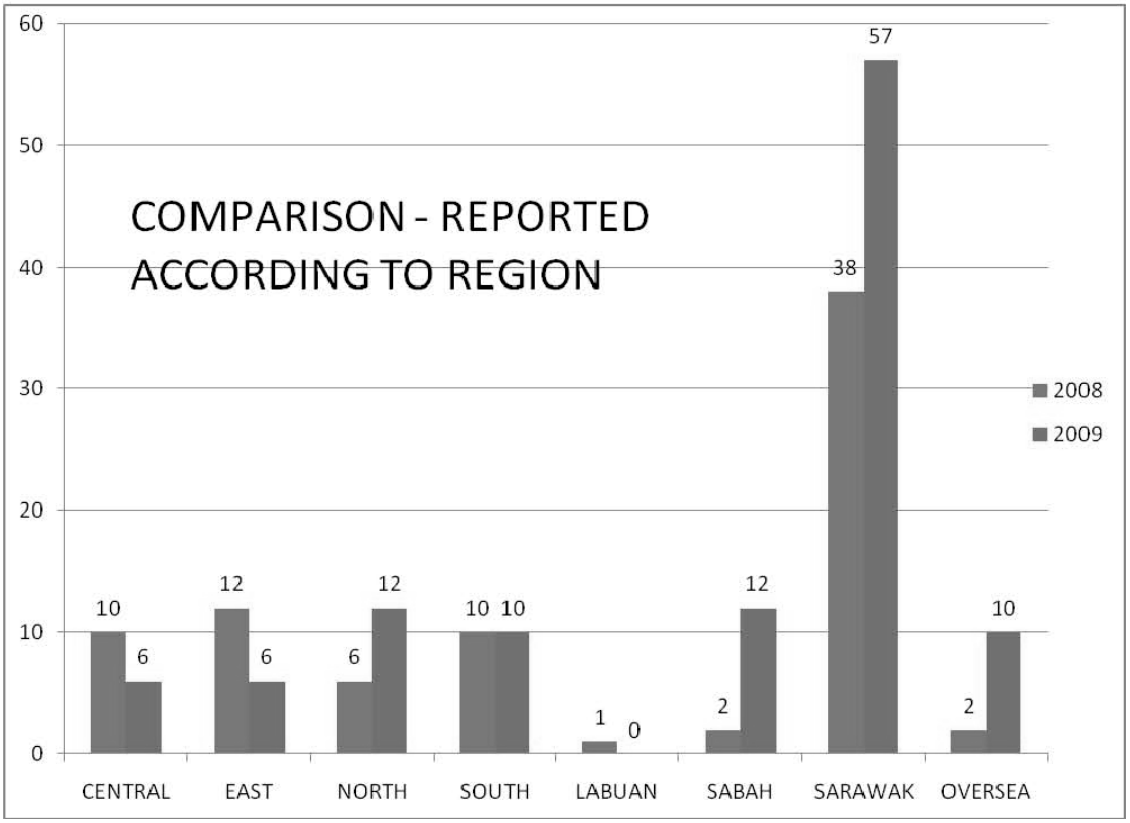
YEAR	NO OF ACCUDENT REPORTED
UNTIL　OCTOBER 2010	43
2009	113
2008	81
2007	25

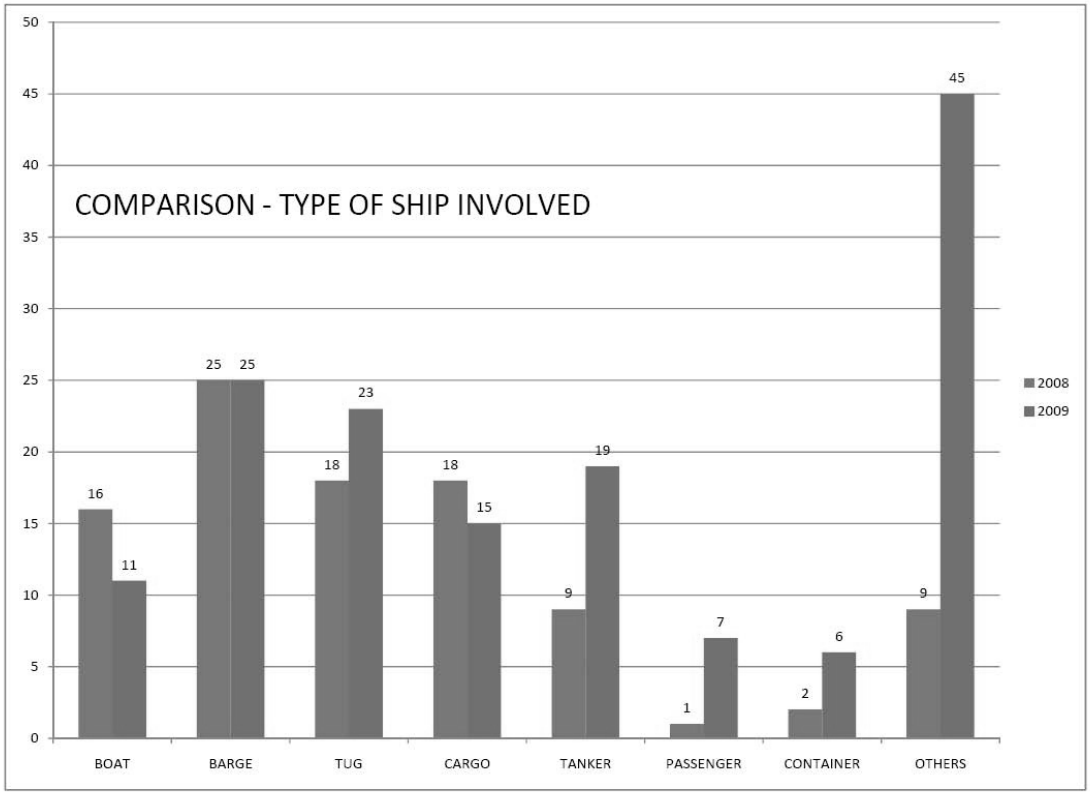
TOTAL NUMBER OF ACCIDENT REPORTED IN MALLACCA STRAIT

YEAR	NO OF ACCUDENT REPORTED
UNTIL　OCTOBER 2010	3
2009	6
2008	11
2007	7

For the year 2008 and 2009 only







（フィリピン共和国）

2006 年： 同年に調査を行った事故は 3 件で、2 件が沈没、1 件が衝突であった。関与船舶は、3 隻が鋼製船で、1 隻は木製のアウトリガーであった。

2007 年： 同年に調査を行った事故は 3 件で、1 件は船内火災、1 件は座礁、あと 1 件は船内の死亡事故であった。

2008 年： 同年は、8 件の事故調査を行った。関与船舶は、4 隻が旅客船、4 隻が貨物船であった。これらの船舶のうち、3 隻は木製のアウトリガー・ボート、3 隻は鋼製船であった。

2009 年： 4 件の事故が発生し、すべて調査を行った。関与船舶はいずれも貨客船であったが、衝突事故 1 件の場合のみ、衝突の相手船が漁船であった。

MARINE ACCIDENTS 2005 - 2010

Nature of Incident	2005	2006	2007	2008	2009	2010	TOTAL
Sinking		2		3		2	7
Capsizing				5	3		8
Collision		1			1		2
Burning／Fire on board	1		1				2
Explosion	1						1
Grounding			1				1
Death on board	1		1				2
Near Collision							1
						TOTAL	24

Major Maritime Accident 2005 - 2010

Type of Vessels Involve:	Nr.
Passenger / Cargo Vessel	17
Cargo Vessel	7
Tanker Vessel	2
Fishing Boat	1
Total	27

Types Marine Accidents:	Nr.	Dead	Missing
Sinking	7	28	30
Capsizing	8	358	663
Collision	2	10	17
Burning/ Fire on board	2	5	12
Grounding	1	11	
Death on board	2	2	
Explosion	1	2	
Hitting/Ramming Near Mis/Near Collision	1		
Total	24	416	722

（大韓民国）

事故の種類別件数

	衝突	接触	座礁	爆発事故	沈没	機関の故障	遭難	重大な損傷	死傷	インシデント	その他	合計
2005	172	10	46	71	45	166	16	2	34	41	55	658
2006	167	17	66	41	25	195	11	1	20	68	46	657
2007	148	9	39	37	19	185	8	1	11	65	44	566
2008	125	15	32	25	18	145	11	2	17	61	29	480
2009	160	10	43	34	22	253	16	1	21	94	69	723
Total	772	61	226	208	129	944	62	7	103	329	243	3,084
Ratio（%）	25.0	2.0	7.3	6.8	4.2	30.6	2.0	0.2	3.3	10.7	7.9	100

船舶の種類別件数

	交通船	商船	漁船	油送船	タグボート	その他	合計
2005	8	99	657	24	37	59	884
2006	17	110	584	43	53	58	865
2007	13	96	495	31	55	69	759
2008	19	63	435	25	52	42	636
2009	7	83	725	18	35	47	915
Total	64	451	2,896	141	232	275	4,059
Ratio（%）	1.6	11.1	71.3	3.5	5.7	6.8	100

船舶のトン数別件数

	20ﾄﾝ以下	20ﾄﾝ～100ﾄﾝ	100ﾄﾝ～1,000ﾄﾝ	1,000ﾄﾝ～5,000ﾄﾝ	5,000ﾄﾝ～10,000ﾄﾝ	10.000ﾄﾝ以上	不明	合計
2005	364	297	78	79	12	26	2	884
2006	276	334	81	97	17	30	-	865
2007	236	278	86	90	17	17	6	759
2008	194	271	69	59	8	21	-	636
2009	356	373	67	51	19	24	-	915
Total	1,426	1,553	381	376	73	118	8	4,059
Ratio (%)	35.1	38.3	9.4	9.3	1.8	2.9	0.2	100

3　船舶事故調査制度及び組織について
（以下は、原文(英文)の和訳である。）

（中華人民共和国）

＊　海難調査に関する中国の制度と組織

1. 国内法と国際法

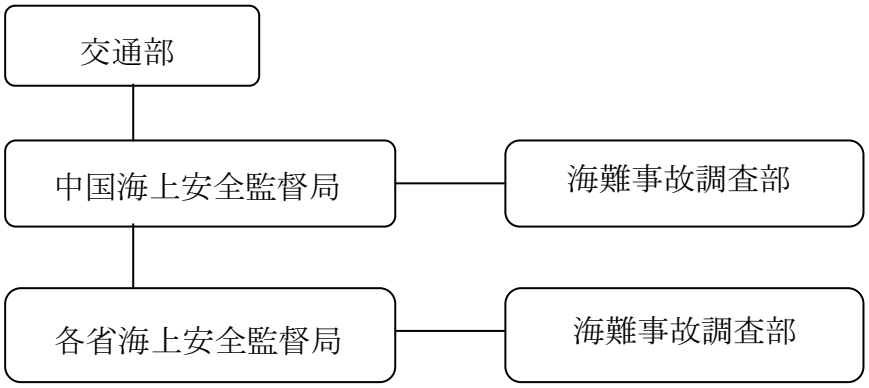
海上交通安全法第 3 条：中国海上安全監督局（CMSA）は、沿岸海域の安全を司る主務官庁として、同海域内の海上交通の安全に関して一元的な管理監督責任を担う。

また同時に、中国海上安全監督局は、国際海事条約、国際海事法典等の実施に関する責任官庁としての役割を担う。

海難事故の調査は、CMSA 海難事故調査部が担当する。

2. CMSA による海難事故調査

どの部署が担当するのか?



3. 海難事故調査部海難事故調査の目的

以下を実行することによって、水上輸送の安全を向上させると同時に、MSA に課せられた法的義務を果たすこと。

⑴　すべての事故を対象に、その原因と状況を特定するための調査を行う。
⑵　事故の原因と状況の再現可能性を低減させるための提言を行う。
⑶　関係当事者に責任を負担させる。
⑷　事故はどのようにして起こるか、という点について、関係者の意識を向上させる。

4. CMSA による事故調査の対象物は何か？

⑴　中国沿岸海域内のすべての船舶

⑵　あらゆる大きさの商船
⑶　商船と衝突した漁船
⑷　プレジャー・ボート（商業用及び個人用）
⑸　搭載設備
⑹　その他

5.　CMSA は何を調査するのか?
⑴　衝突、追突、波浪による被災;
⑵　座礁、擱座
⑶　火災／爆発;
⑷　沈没、転覆;
⑸　機関等の故障;
⑹　船内の死傷者;
⑺　その他、重大な損傷または死傷を伴った事故.

6.　CMSA はどのような方法で調査するのか?
⑴　何が起こったのか？
⑵　どのようにして起こったのか？
⑶　なぜ起こったのか？
⑷　再発防止のために何ができるか？
⑸　事故の責任をどのような割合で負担させるか？

7.　1984 年海上交通安全法
船長、船主及び乗組員は以下の義務を負う:
⑴　定められた時間内に事故報告を行う。
⑵　検査官に協力する。
⑶　証拠を保存する。

8.　検査官は以下を要求することができる。
⑴　申告書および書類の提示
⑵　証拠の提示
⑶　船内および施設内への立ち入り

9.　証拠の保存
⑴　GPS

⑵ チャートプロッター
⑶ コースレコーダー
⑷ 航海データレコーダー
⑸ 塗料サンプル
⑹ その他

10. 聞き取り調査

11. フォローアップ業務

CMSA は独自に塗料サンプル分析センターを有するほか、一部外注を通じて以下の業務を行う。

⑴ 設備機器の試験
⑵ 法医学上の試験
⑶ 塗料のサンプリング
⑷ 負荷試験
⑸ 安定性および耐航性に関する試験
⑹ その他

12. 専門家による検討

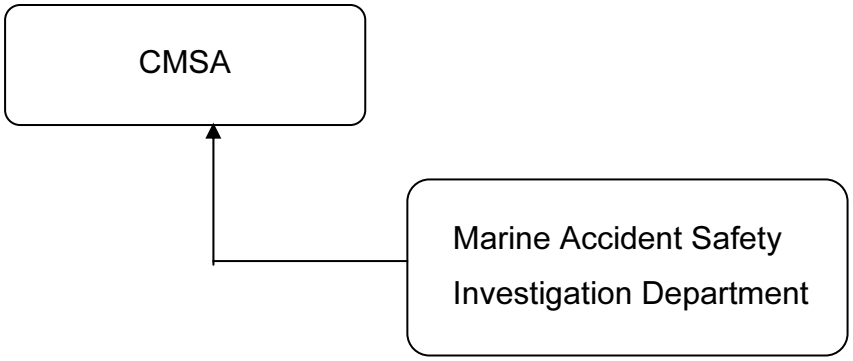
13. CMSA が行う調査の種類

⑴ 予備調査（PE）
- 2 名以上の検査官を現場に派遣する。
- 本格調査を支障なく行うために、事故の原因と状況を把握する。
- データベースへの入力を行う。
- 可能な提言を行う。

⑵ 本格調査
- 徹底的調査
- 調査報告書の作成
- 調査報告書の公表

14. CMSA 内部の海難事故安全調査

2009 年末、CMSA に直属する独立の専門機関として、海難事故安全調査部が CMSA 本部内に設立された。



⑴ 海難事故安全調査の目的

以下を実行することによって、水上輸送の安全を向上させると同時に、CMSA に課せられた国際的義務を果たすこと。

- IMO コードに定められた非常に重大な海難事故等の重要な事故を対象に、その原因と状況を特定するための安全調査を行う。
- 事故の原因と状況の再現可能性を低減させるための提言を行う。
- 海難事故調査を通じて国際協力を進める。

⑵ 対象となる事故

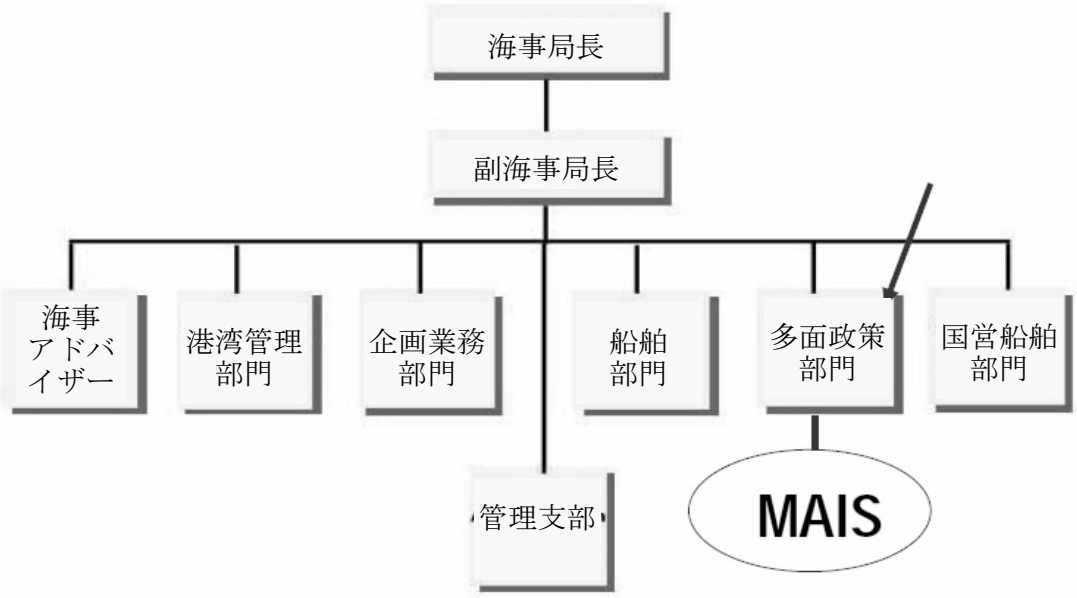
世界各地を航行する中国籍の船舶または中国沿岸海域を航行する外国籍の船舶において発生する海難事故（アクシデント）およびインシデントであって、IMO コードパラグラフ 2.22 の定義による非常に重大なアクシデントまたはインシデントに該当するもの。

⑶ CMSA が行う安全調査の性格

中国 MSA による海上の安全に関する調査は、各関係機関が実施する行政上、民事上、刑事上の各種調査に代わって行われるものではなく、これらの調査とは一切抵触せずに、別途並行して実施されるものである。それらの各種調査によって収集された証拠資料は海上の安全に関する調査にも使用されるが、海上の安全に関する調査によって収集された情報は、通常、行政上、民事上、刑事上の各種調査に使用することはできず、司法当局への開示も要求されない。

（中華人民共和国香港特別行政区）

香港海事局組織図



注：いずれの部門名も定訳ではありません。

概観　(http://www.mardep.gov.hk/en/publication/eoverview.html)
海難調査航行安全政策支局
（Marine Accident Investigation and Shipping Security Policy Branch）

海難調査部（MAIS）は、2000 年 1 月、船舶部門から海難調査航行安全政策支局傘下の多面政策部門に移管された。この組織変更により、海難事故の調査は、海事局の他の部署から独立して実施することが可能になり、一方、船舶部門および港湾管理部門は、海難事故調査業務から切り離されたことによって、船舶の安全と香港各港の管理を司る管理／規制当局としての業務に専念することができる体制となった。

MAISSPB は、香港域内および香港籍船舶の船内で発生したすべての海難事故を調査する。また、MAISSPB は、商船条例（第 281 条）、船舶港湾管理条例（第 313 条）および水先案内条例（第 84 条）に基づいて義務付けられた公的調査を併せて実施する。MAISSPB が実施する調査の主たる目的は、海上にお

ける人命の安全の向上を図るために、事故の状況とその原因を明確に把握すると同時に、調査結果を公表することによって事故の再発を防止することにある。責任の追及及び懲戒の実施は、調査ないし報告の目的としない。

上記のほか、本サイトには、重大な事故及びきわめて重大な事故について、その要約と教訓、及び詳細報告書が掲載される。

海難事故調査
(http://www.mardep.gov.hk/en/pub_services/casualty.html)

法律上の義務として、世界各地を航行する香港籍の船舶及び香港海域内を航行する他国籍の船舶が関与した海難に関しては、そのすべてについて海事局長への報告がなされなければならない。

香港海事局海難調査航行安全政策支局は、海難事故の調査を行って事故が発生した状況と原因を明確にすることにより、当該船舶及びその搭載機器の設計、構造及び保守、運航基準及び運航手続、乗組員の能力等に関する欠陥を明らかにし、事故の再発を防止するための改善策を策定する。調査に基づいて提起された提言は、海事局が十分に内容を検討の上、安全基準の向上に役立つものであれば具体的に実行する。

（インドネシア共和国）

インドネシアでは、NTSC が、安全強化の観点から事故の調査を担当している。調査の主たるコンセプトは、IMO の決議に謳われた調査目的を遵守することにある。NTSC が行う調査は、事故の事実関係を把握し、危険な行為と危険な状況を見定め、それらの調査結果に基づいて各関係当事者に必要な提言を行うことを目的とする。

NTSC は、現在、運輸省の傘下にある。運輸省には、陸上運輸、鉄道、海運及び航空の各輸送分野ごとの担当局が置かれている。IMO の規則に沿っていえば、インドネシア共和国の海事主務機関は運輸省海運総局であり、同局が規制当局としてインドネシアの海事行政を主管する。

NTSC の組織は、1999 年の大統領令第 105 号によって制定された。現在、NTSC は、同大統領令に基づき、陸上安全調査委員会、海上安全調査委員会、および航空委員会の 3 つの専門委員会によって組織されている。事務局は、訓練、財務、雇用など、組織内の管理業務を担当する。

また同大統領令に従い、調査の実施、調査報告など調査にかかわる事項については、NTSC が直接運輸大臣に対して説明責任を負担する。NTSC は、調査報告を一般に公開する場合、先ず最初にその調査報告書を運輸大臣に提出しなければならない。

インドネシア域内で事故が発生した場合、2 つの調査機関が事故調査を実施する。NTSC は、安全の向上を主たる目的として安全上の調査を実施する。NTSC は、調査ガイドラインの基準に基づいて調査を実行しなければならない。

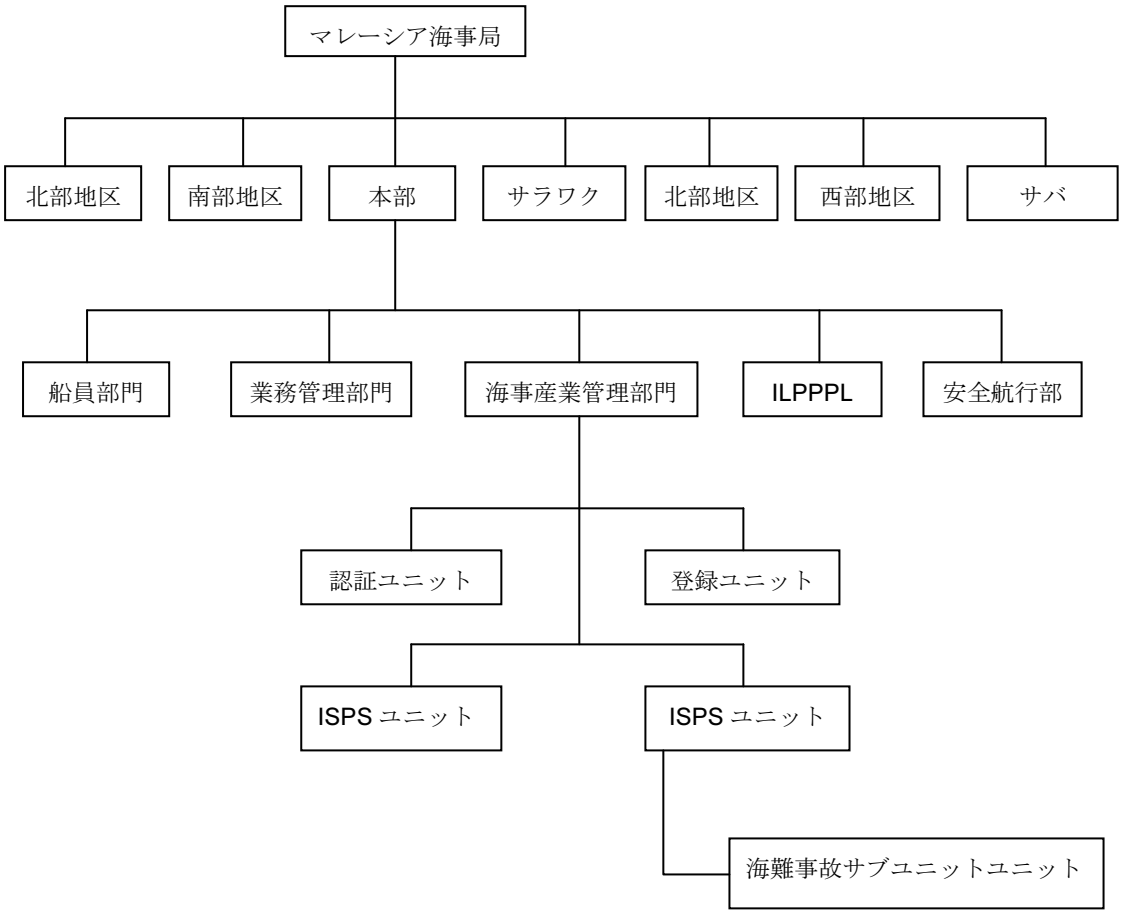
一方、運輸省海運総局（DGSC）は、規制当局の立場から、行政面での調査を行う。この調査では、2008 年法律第 17 号（海運法）により、港長が、関与当事者から提出された事故報告書に基づいて海難インシデント／事故の初期調査を行う。港長が実施した事故調査の結果は、必要に応じて海難審判所において証拠として採用され、行政責任や船員に対する懲戒処分を決定する際の資料として使用される。

海難審判所は、審判結果のコピーを海運総局に送付する。

（マレーシア）

海難事故調査のデータ収集は、海事産業管理部門の ISM コード・ユニットの下に、傘下のサブユニットが組織的に行っている。海難事故の調査は、事故現場に近い地域の検査官が実施する。

以下に組織図を示す。

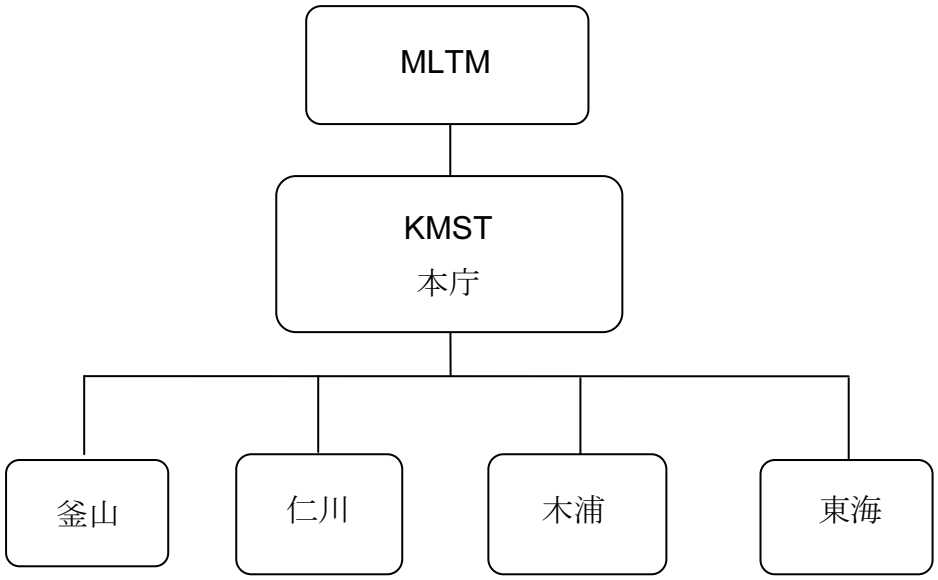


（フィリピン共和国）

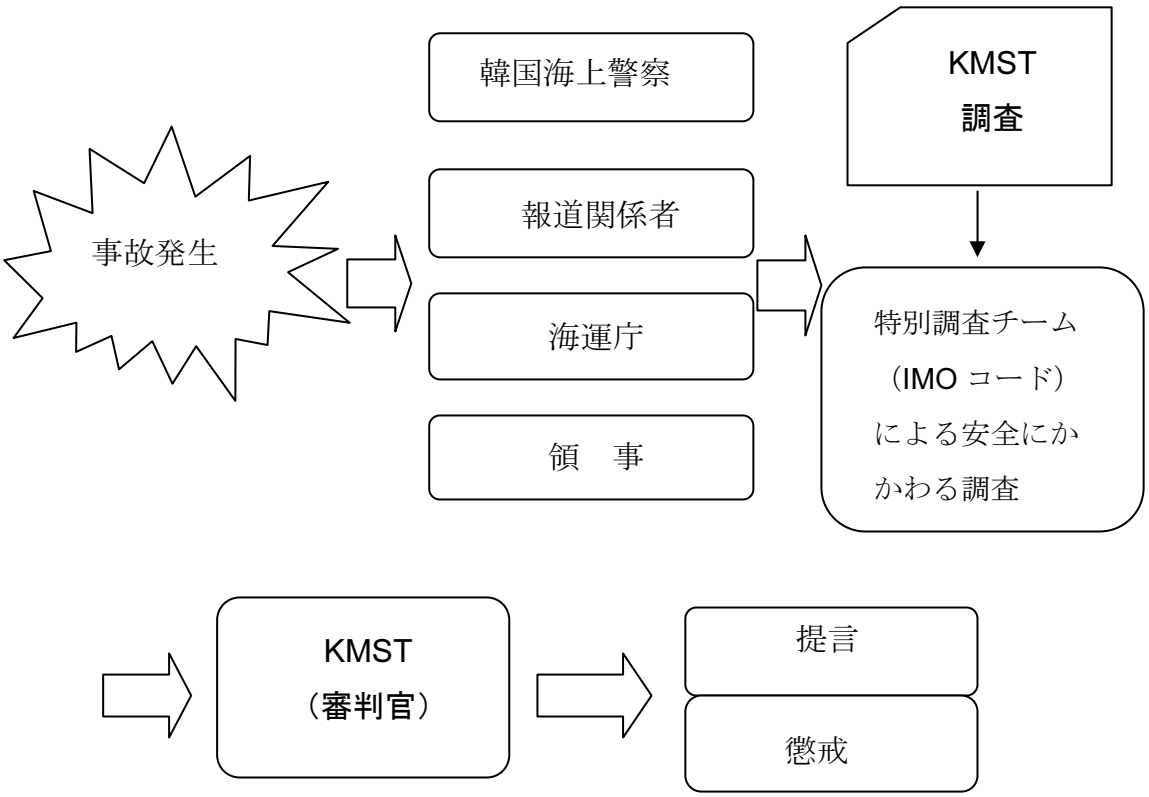
フィリピンの海難事故調査はフィリピン沿岸警備隊が担当し、同沿岸警備隊が事故調査結果の報告と提言を運輸通信大臣あてに行っている。通常、決議による提言の一部には、免許の停止が含まれる。現在、新たな沿岸警備隊法の制定により、過失調査を海難事故調査委員会の任務から外し、同委員会を「原因究明」調査に専念させる計画が進行している。

（大韓民国）

KMST の組織



KMST の調査システム



4　船舶事故調査官の訓練制度の現状について
（以下は、原文(英文)の和訳である。）

（中華人民共和国）

＊　中国 MSA による事故調査官の研修

1. CMSA 事故調査官の研修

⑴　下級調査官向け研修コース

- 研修センターで実施される 3 週間のコース
- 事故調査に関する各種講義
- オンザジョブ・トレーニングと体験

受講者の要件：

- 海事法で定められた所定の資格試験に合格していること。
- 関連専門分野において一定の知見を有すること。
- 海事分野の業務経験が 3 年以上あり、海事調査の経験が 1 年以上あること。

⑵　中堅調査官向け研修コース

- 研修センターで実施される 3 週間のコース
- 事故調査に関する各種講義
- オンザジョブ・トレーニングと体験

受講者の要件：

- 海事法で定められた所定の資格試験に合格していること。
- 関連専門分野において一定の知見を有すること。
- 海事分野の業務経験が一定の年数に達していること。

⑶　上級調査官向け研修コース

- 研修センターで実施される 2 週間のコース
- 最新の調査技術および調査手法に関する各種講義

受講者の要件：

- 海事法で定められた所定の資格試験に合格していること。
- 関連専門分野において一定の知見を有すること。
- 海事分野の業務経験が一定の年数に達していること。

2. 事故調査官研修コースの内容

⑴ 学習科目

- 準拠すべき国内及び国際間の法令、規則及びコード（A／B／C）
- 基本コンセプト、航海術、船舶工学、事故報告、調査管轄権、海洋漁業、調査証拠、海上交通工学、損失評価（A／B／C）
- 聞き取り調査手法
- ヒューマンファクター
- 海事英語
- 物的証拠の採取
- 鑑定証人
- リスク分析
- VDR のダウンロード／プレイバック＆分析
- 火災調査
- ISM監査船橋リソース管理

⑵ 学習による成果

- 事故の調査プロセス
- 準備
- 緊急時の対応
- 証拠の収集
- 業務の安全
- 証拠の分析
- 責任の特定と配分
- 関係当事者との協力
- その他

3. オンザジョブ・トレーニングと成果の向上

- 調査チームとしての役割
- 早い段階での専門性の発揮
- 上席調査官による助言
- 小規模調査の指揮
- 事故調査官の認証
- その他

4. 海外研修

２年ごとに、一定の人数（20～30名）の調査官をMAIB、NTSB、ATSB等の各機関に派遣し、調査技術や調査方法の習得及び意見交換等の研修を実

施している。

ここ数年の海外研修では、VDR に関する意識向上トレーニング、事故調査が研修内容に含まれている。

（中華人民共和国香港特別行政区）

＊　MAIS 訓練システム

⑴　MAI 訓練コース（IMO、NTSB、その他）
⑵　オンザジョブ・トレーニング（インターネット・トレーニング／ガイダンス・ノート）
⑶　海難調査安全セミナー（MAIFA、MAIIF、JMAIA、その他）

（インドネシア共和国）

近年、NTSC は、事故調査官を対象に定期的な研修を行っている。研修には、基本的な調査訓練、人的要素、報告書の書き方、血液媒介病原菌等の内容が含まれる。NTSC は、ATSB との協力の下に、研修プログラムの開発に努めている。

（マレーシア）

マレーシア海事局は、内部の海難調査官及び下級調査官（本部及び地方事務所）を対象に、海難事故調査の研修を実施している。

研修コースは、IMO のガイドラインに沿って実施される。最新のコースは、2010 年 12 月 7 日に実施される。

また、マレーシア海事局は、他国が実施する海難事故調査の研修コースにも職員を派遣している。最近では、11 月 3 日から 14 日にかけて実施された中国珠海での研修に参加した。

海難事故の調査に当たる上級調査官に従って実際に調査を体験する下級調査官向けのオンザジョブ・トレーニング

（フィリピン共和国）

フィリピン沿岸警備隊は、創設以来、海難事故の所管官庁として各海難インシデント／事故の調査を行ってきた。海難事故調査は、一時、沿岸警備隊情報調査本部（CGIF: Coast Guard Intelligence and Investigation Force）が担当した時期もあったが、同本部は改組によって調査の任を解かれ、現在は情報活動のみに専念している。その後、沿岸警備隊内務部門（CGIAS: Coast Guard Internal Affairs Services）が調査を行ったりもしたが、残念ながら、CGIFの担当者もCGIASの担当者も、海難事故調査の正式な訓練を受けていなかった。訓練を受けた調査官も配備されていたが、いずれも、海難以外の事故が専門であった。現在では、海難事故調査委員会が、その調査活動を通じ、海難事故の調査機関としての役割を果たしている。現在は、海難事故調査に関するセミナーや研修等への参加経験のある調査官も少なくないが、フィリピン沿岸警備隊では、まだ専門的な訓練コースを設けていない。

資料「東アジア各国等の船舶事故調査報告書」

（中華人民共和国）

Report on the Investigation of the Collision between high speed passenger craft San Bu and cargo vessel Yue Guang Zhou Huo 0217

Guangzhou, China

On 5th November 2009

China Maritime Safety Administration
11#, Jianguomennei Avenue,
Beijing, China
100736

CONTENTS

SECTION 2-ANALYSIS

GLOSSARY OF ARRBREVIATIONS, TERMS AND ACRONYMS

GPS: Global Position System

AIS: Automatic Identification system

VDR: Voyage Data Recorder

VHF: Very High Frequency

ISM: International Management Code for the Safe Operation of Ships and for Pollution Prevention

DOC: Document of Compliance

CCS: China Classification Society

EXECUTIVE SUMMARY

At 1953hrs 40″ on 5th November 2009, high speed passenger craft San Bu, en route from China Hong Kong SAR to Lianhuashan Passenger wharf, Panyu, Guangzhou, China, collided with private cargo vessel Yue Guang Zhou Huo 0217 at about 140 meters upstream from Shabei ferry of Fu Lian Gang water channel of Panyu, Guangzhou, resultantly the bulkhead above the middle waterline of lower passenger hold at the port of "San Bu" breached, 2 passengers died, 9 were injured, the conveyer at bow of Yue Guang Zhou Huo 0217 broke off.

INVESTIGATION

Immediately after the accident, a dedicated investigating team was set up with in China MSA to investigate the collision. The investigating team consisted of several groups, and each group at once started their investigation work into the different aspects of the accident simultaneously and corroboratively. Many of the passengers of the high speed craft were interviewed; their accounts of the accidents were obtained. The investigators attended both collision vessels, examined the scene and interviewed the crucial crews from both vessels; copies of relevant video tape and relevant documents were obtained including log book entries, statutory certificates, maintenance records, procedures and permits.

Information relating to the accident was also obtained from the Guangzhou Traffic Services Center.

The investigators also request San Bu to be surveyed after the collision, especially her waterjet propulsion system, and a copy of the survey report was provided to the China MSA.

SECTION 1—FACTUAL INFORMATION

1.1 PARTICULARS OF San Bu / Yue Guang Zhou Huo 0217

Vessel details

Ship's Name: San Bu	Call Sign: BXBT
IMO number: 9082532	Port of Registry: Jiang Men
Ship's Type: High-Speed Passengers Ship	Hull Material: aluminium alloy
Gross Tonnage : 524	Net Tonnage: 175
Length: 39.90 meters	Breadth Moulded: 11.50 meters
Depth Moulded: 3.80meters	passenger spaces: 368 persons

Propeller type and numbers: waterjet (type: KAMEWA 71 S II), 2

Power of the Main Engine: 1960.00 kw ×2

Builder: Australian Osters Shipyard

Built Date: 1st October 1993

Ship Owner: Guangdong San Bu Port Passengers and Goods Carriage Joint operation Co., Ltd

Ship's Operator: Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd

Figure1: San Bu

Vessel details

Ship's Name: Yue Guang Zhou Huo 0217

Former Name: Yue Pan Yu Huo 3501

Port of registry: Guangzhou Ship's Registry Number: 090103001088

Ship's Type: self-discharging sand carrier Hull material: ferrocement

Gross tonnage: 164 Net Tonnage: 91

Length: 33.00 meters Breadth Moulded: 7 meters

Depth Moulded: 2.30 meters Reference cargo deadweight: 145.00 tons (inland river A class navigation zone)

Main Engine Type: internal-combustion engine number: 1

Power of the main engine: 94.50 kw

Propeller type: screw propeller number:1

Builder: Panyu Xichong Shipyard

Built Date: 1992-9-1

Ship owner: Luo En Zai

Ship Operator: Guangzhou Jiang Ming Shipping & Dredging Co., Ltd

Figure 2: Yue Guang Zhou Huo 0217

1.2 MANNING AND WATCH KEEPING

1.2.1 Manning onboard San Bu

At the time of collision, San Bu was carrying a crew of 9, which met requirements of the Minimum Safe Manning Certificate.

The Master Zheng Zhi Sen, male, born on 10th September 1957, graduated from Guangdong Shipping School at the end of 1980. He obtained master's certificate for second class ships of gross tonnage of 200-1600 in 1986, at time of collision he held master's certificate for ships of gross tonnage of 500-3000 issued by Guangzhou MSA on 15th May 2006, certificate number was BKL121200600503.

Duty Radar Observer Yao Zeng Die, male, born on 28th November 1951, he held master's certificate for ships of gross tonnage of 500-3000 issued by Guangzhou MSA on 26th June 2006, and certificate number was BKL121200600853.

The Duty Night Viewing Lookout Li Mu Yu, male, born on 7th September 1972, he obtained master's certificate for ships of gross tonnage of 3000 and above issued by Guangdong MSA on 23rd July 2007, certificate number was YKA111200706728.

The Duty A/B Liang Wei Qiang, male, born on 18th February 1962, he held quartermaster Certificate for ships of 500 gross tonnage and above issued by Guangzhou MSA on 5th February 2007, certificate number was BKL145200700322.

The Duty C/E Zhao Chong Yue, male, born on 20th February 1957, he held C/E certificate for ships of main engine of 750-3000kw issued by Jiangmen MSA on 19th November 2007, certificate number was BKH221200700097.

The watch keeping

The whole journey from China Hong Kong SAR to Lian Hua Shan Passenger Wharf, Guangzhou, takes 1 hour and 50 minutes, among which, the voyage leg from China Hong Kong SAR to Tong Luo channel and Humen Bridge to Lian Hua Shan Passenger Port was conducted by the master, the voyage leg of Tong Luo Channel to Humen Bridge was conducted by C/O. The crews of the ship were keeping 6 days on and 3 days off schedule. In the last 6 days prior the collision, the ship had 4 voyages per day for 2 days, 3 voyages per day for 4 days. In general, 6 days working time is not long, the master should had enough rest and there was no likelihood of fatigue effect.

The Crews' experience

The Master Zheng Zhi Sen, graduated from Guangdong Shipping School majored in navigation in 1980, since then he had worked onboard vessels, he has been working as master of high speed craft since 1996, and richly experienced in high speed craft navigating.

Alcohol using and medication

During investigation, at the first time of meeting the Master, though on alcohol test was carried out, there was no sign of drinking. During the prior week, the master did not take any cold cure or Blood Pressure Lowering medicine, etc. therefore the investigators believe that it is not likely the master's judgment was impaired due to alcohol use or medication.

1.2.2 Manning onboard Yue Guang Zhou Huo 0217

At the time of collision, the ship was carrying a crew of 3, which met requirements of the Minimum Safe Manning Certificate.

The Duty Deck Officer Lin Wang Xing at time of collision, female, born on 1st December 1956, she held competency certificate for second class 2/O of inland river vessel issued by Guangzhou MSA on 11th March 2006, certificate number was 440126195612016921.

The Duty Engineer at time of collision Luo En Zai, male, born on 1st December 1955, held competency certificate for second class 3/E of inland river vessel issued by Guangzhou MSA on 3rd April 2006, certificate number was 440126195512016916.

The Duty A/B Chen Shu Kun, male, born on 1st January 1955, held the seaman's record book issued by Guangzhou MSA on 30th December 2005, number was 1511113935.

The watch keeping

On the 1st November 2009, the ship loaded coal at Guangzhou Zhu Dian wharf, destining for Panyu Shiqiao; on 5th, she loaded coal at Xiji Wharf of Guangzhou Xingang Port and intended to return to Panyu Shiqiao, the accident occurred in Fu Lian Gang water channel as she making her way back to Panyu Shiqiao. The normal trip from Zhudian wharf or Xiji wharf to Panyu Shiqiao usually takes a little more than 3 hours, and does not usually cause fatigue effect to crews.

Crews' working experience

The deck officer Lin Wang Xing, a primary school drop off, obtained 2/O competency certificate for 3rd class inland river vessel in 2001, since then she has been working onboard ships. Lin Wang Xing has poor degree of education and she could not adequately understand Regulations for Preventing Collisions at Sea and rules of port, and inland river vessel deck officer training program does not include the *INTERNATIONAL CONVENTION FOR PREVENTING COLLISIONS AT SEA, 1972.*

Alcohol use and medication

During investigation, at the first time of meeting the deck officer, there was no sign of drinking. During the week prior the collision, the deck officer did not take cold cure or Blood Pressure Lowering medicine etc. Thus the investigators believe it was not likely that deck officer Lin Wang Xing was affected by fatigue or impaired by medication at time of collision.

1.3 Companies

1.3.1 Company of San Bu

The registered owner in the ownership certificate of San Bu is Guangdong San Bu Port Passengers and Goods Carriage Joint operation Co., Ltd. From 21st September 2007 to 31st August 2009, Guangdong San Bu Port Passengers and Goods Carriage Joint operation Co., Ltd. rent out "San Bu" to Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd, during the rental period Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd managed San Bu according to the safety management system of Chu Kong Shipping Enterprises (Holding) Co., Ltd. On 20th June 2009, a sales contract was concluded between Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd and Guangdong San Bu Port Passengers and Goods Carriage Joint operation Co., Ltd., which stipulated the time for delivery of vessel was 28th February 2009, but at the

time of the accident, the proprietary rights of the vessel was not handed over, Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd alleged that they were handling the formalities of transferring of the proprietary rights.

Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd is the subsidiary company of Chu Kong Shipping Enterprises (Holding) Co., Ltd; it is engaged in passengers carrying between Hong Kong and Macao Route. The company was founded on 8th January 1986, it now operate and manage 4 high speed catamaran ferry boats: Lian Shan Hu, Lian Gang Hu, San Bu, Nan Gui. The vessels owned by the company and the company's shore office were managed by Chu Kong Shipping Enterprises (Holding) Co., Ltd. in November 1998 and March 2005. Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd now has 45 staff and its shore office has 8 staff, one general manager, one deputy general manager, one technical department manager & guide of captain, one technical department deputy manager, one passengers transport department manager, one deputy passengers transport department manager, one director and one dispatch operator.
The establishment of safety Management system and the audit
Chu Kong Shipping Enterprises (Holding) Co., Ltd. established Safety Management System on 1st March 1998 according to *the Notice of execute safety management audit and issue of certificate regarding mainland high speed passengers' ship sailing Hong Kong route* issued by Ministry of Communication (Jiao an Jian Fa [1998] No. 123). In April 2009, the company passed the audit of recertification and held the DOC (no.08A008, valid period till 27th April 2014) issued by China MSA on 17th April 2009, which applied to high speed ferry. San Bu held a safety management certificate (no. BJ098829) that issued by CCS on the 9th August 2009. At present, there are 8 companies managed by Chu Kong Shipping Enterprises (Holding) Co., Ltd. which are Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd, Shunde Passenger Transport Joint Operation Co., Ltd, Jiangmen Hong Kong & Macao Passenger Transport Joint Operation Co., Ltd, Zhongshan Passenger Transport Joint Operation Co., Ltd, Dongguan Humen Wei Long Passenger Transport Co., Ltd, Guangdong San Bu Port Passengers and Goods Carriage Joint operation Co., Ltd, Gaoming Ming Zhu Passengers Joint operation Co., Ltd, He Gang Passengers Joint operation Co., Ltd.

Respectively on 16th December 2008 and on 12th September 2009, Chu Kong Shipping Enterprises (Holding) Co., Ltd. internally audited the safety management and anti-pollution activities of San Bu and the shore offices of Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd, and corrected the unqualified items and re-audited satisfactory.

The emergency response to the accident
At 1954hrs 5th November 2009, upon receiving the accident report, Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd immediately reported the collision to Chu Kong Shipping Enterprises (Holding) Co., Ltd., in the meantime reported the collision to Lianhuashan Office of Panyu Marine Department, Lianhuashan Passenger Transport frontier inspection, customs, inspection and quarantine, 120 emergency center etc. After received the collision report, Chu Kong

Shipping Enterprises (Holding) Co., Ltd. immediately started the emergency plan and established emergency handling team, dispatched relevant personnel to the scene. Before the emergency handling group members arrived at the scene, Chu Kong Shipping Enterprises (Holding) Co., Ltd. required Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd to immediately start their emergency plan and liaise with the shore units and 120 emergency center etc. to ask for support; liaise with San Bu to understand the on board casualty and injuries and the ship's damage, arrange San Bu to berth along the wharf as soon as possible if the ship was able to continue her voyage. In light of the instructions, Guangzhou Panyu Lian Hua Shan Port Passenger Transport Co., Ltd directed San Bu to try best to save the injured, conciliate all passengers and report the casualty and injuries and the ship's damages and ship's berthing time etc. to shore units and 120 emergency center. At about 2005hrs, San Bu berthed along the wharf. As coordinated by Panyu District Government, each shore unit and 120 emergency center respectively performed their obligation, the passengers were evacuated and the injuried were taken to hospital and the deceased were evacuated properly as well.

1.3.2 Company of Yue Guang Zhou Huo 0217

There are 38 ships (all are inland river ships) managed by Guangzhou Jiang Ming Shipping & Dredging Co., Ltd, in which, 6 are self-owned, 32 are entrusted to manage; Yue Guang Zhou Huo 0217 is one that entrusted for management. This company has 100 crews, among whom, own crews are 6 persons, hired crews are 94 persons. Shore office staffs are 7, among whom, 1 general manager, 1 deputy general manager, 1 marine affair manager, 1 engine affair manager, and 1 financial manager.

The safety management

Guangzhou Jiang Ming Shipping & Dredging Co., Ltd had not established safety management system. The company calls upon the owners of the entrusted vessels to hold safety meeting twice a year to assist each vessel in annual inspection and recertification etc. when the vessel is under the safety inspection by marine department, the company will dispatch personnels to attend onboard the vessel as consulters.

The emergency response to the accident

At 2018hrs 5th November 2009, the deputy general manager Chen Jin Cai received the report from Yue Guang Zhou Huo 0217 that Yue Guang Zhou Huo 0217 collided with high speed passenger craft San Bu, upon receiving the report he proceeded to the scene immediately. After the preliminary evaluation of the damages to Yue Guang Zhou Huo 0217, for the safety purpose and preventing another accident, Yue Pan Yu Huo 1015 was requested to proceed to the scene to anchor along side by side with Yue Guang Zhou Huo 0217, and crews from both vessels were instructed to adopt relevant safety measures.

1.4 The ships' survey

1.4.1 Ship's survey of San Bu

The ship's latest survey report was issued by CCS, the ship's survey certificates are complete and valid, and the survey shows the ship was in normal condition.

1.4.2 Ship's survey of Yue Guang Zhou Huo 0217

This ship's inland river ship's survey certificates were issued by Guangdong Register of Shipping, Panyu Office, the certificates are complete and valid, and the survey shows the ship was in normal condition.

1.5 Passengers/cargo loaded

1.5.1 Passengers onboard San Bu

There were 75 passengers in this voyage, among whom, 26 were foreigners, 49 were Chinese (including Hong Kong).

1.5.2 The cargo loaded onboard Yue Guang Zhou Huo 0217

138 tons of coals were loaded at Xiji Wharf of Guangzhou Xingang for this voyage.

1.6 Other information

1.6.1 San Bu

The propulsion system of this ship is composed of 2 separate systems, which were respectively located at the left and right engine room. The operation mainly relies on remote control on the navigation bridge, only when necessary manual override can be activated in engine room.
The company's safety management documents stipulate that when the vessel is engaged in berthing piers, maneuvering in and out of the port, sailing in complicated route, the bridge shall adopt separate control over each main engine in order to improve the maneuver performance in complex navigation zones and complicated routes, and to be more flexible regarding collision avoidance.

1.6.2 Yue Guang Zhou Huo 0217

This boat has one cargo conveyer, it extends outward 15 meters from the bow, plus the length of the vessel of 30 meters, the actual length is 45meters. The conveyer is hard to see in the night, and the radar echo could not recognize.

1.7 The Traffic Circumstances at the Accident Waters

.1 Weather Forecast

At 1600hrs 5th November by Guangdong observatory,

In estuary of the Pearl River, it was sunny to cloudy, northeast and east winds force 3, gust force 4, the height of wave 0.6m, visibility 8-18 kilometers.

.2 Statement by the persons involved in the accident

Persons involved stated that, at the time of accident, the weather was fine, the visibility was good, light breeze, light ebb.

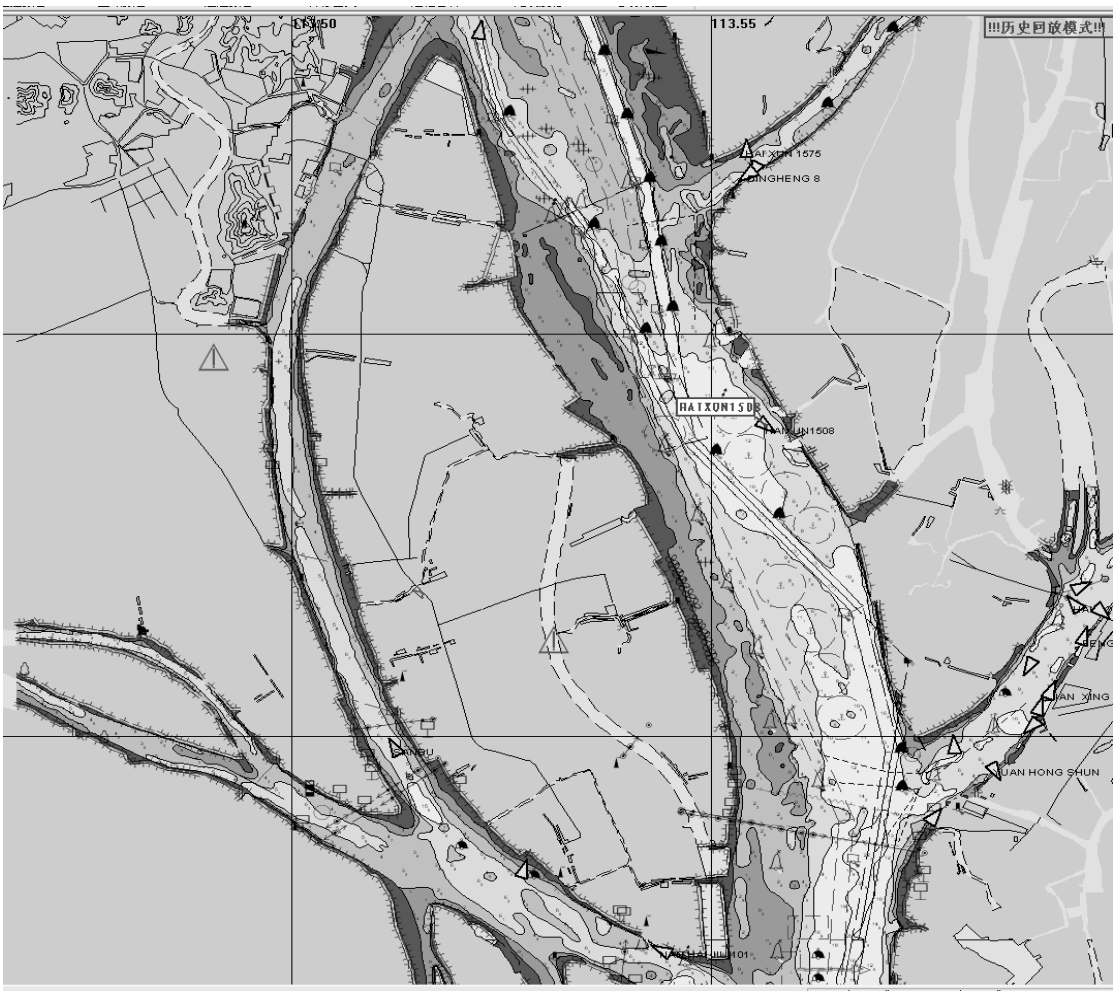
Thus, it is determined that at the time of collision, the weather was fine, the visibility was good, light breeze, light ebb.

.3 The Traffic in the Accident Waters

Fuliangang channel is south and north bounding, the channel is narrow and curving, the north end connects with Lianhuashan channel, the south end connects with Ba Tang Wei waters, the total length is about 6.5 nautical miles, the breadth of navigable water is between 370-400 meters, the natural water depth is 2-6 meters, the class of waterway is inland river I, the dredging maintenance water depth in the waterway is 4 meters. In Fuliangang channel, there are 2 small oil carrier anchorages, one Shabei ferry that connects the opposite shores, 7 shipyards and more than 10 ownership wharfs. The vessels sailing in Fuliangang channel mainly are in and out bound container carriers, high speed ferries, oil carriers and ships repaired/built by the shipyards; generally speaking the traffic is heavy.

The small oil carrier anchorage and Shabei ferry are near downstream to the accident location.

Prior the accident, in the waters area near to the accident location, there were two north-going vessels, San Bu and a sand carrier, there were 4 south-going small vessels, one of them was Yue Guang Zhou Huo 0217; in the small oil carrier anchorage were anchored 2 vessels, Pan Long You 28 and another one.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1.8 The Search and Rescue

After the accident happened, master of San Bu immediately directed C/O and night vision observer to proceed to the passenger deck to treat the injured, calm down the other passengers, and brief the accident in Chinese and English by broadcast and request passengers who were engaged in medical profession to assist in treating the injuries. The master reported the accident to the company by phone and demanded for medical assistance, and reported the collision to local Maritime Safety Administration. After check for the damages to the ship, the damages of the hull were found located a lot above the waterline, and there was no risk of sinking, then the master navigated the vessel to the nearby Lianhuashan Passenger Wharf.

Upon receiving the accident report, Guangzhou MSA forwarded the collision report to Guangdong MSA without delay and reported to the local municipal government as well, meanwhile started the emergency plan, dispatched "Hai Xun 1502" and others 4 vessels in total to the scene to carry out on scene traffic control, escorted San Bu to returned to the intended wharf, dispatched personnel to cooperate with Panyu District Government, Guangzhou to handle the affairs arising from the accident.

Upon receiving the collision report, Panyu District Government, Guangzhou took the accident emergency response as first priority, directed Panyu 120 emergency center to dispatch 11 ambulances and 55 doctors and nurses etc. to arrive the scene to rescue.

At about 2005hrs, the vessel berthed along the wharf; the doctors and nurses waiting on the wharf initially treated the 10 injured passengers at scene and then transferred them to hospital, 1 passenger was already dead after check; other passengers were evacuated from San Bu in good order.

1.9 Losses

1.9.1 San Bu

The accident caused 1person died at scene, and another 1 died after transferring to hospital the same day, 9passengers injured and the ship's hull badly damaged.

1.9.2 Yue Guang Zhou Huo 0217

The conveyer at bow was broken off.

SECTION 2—ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 The Analysis and Determination of the Facts of this Collision Accident

2.2.1 Collision time

1953hrs 40″ 6th November 2009.

Reasons:

The collision time provided by night vision video of San Bu is 1950hrs 40″. By checking, the time showed by the night vision video of San Bu was 3 minutes later than that of Guangzhou Traffic Service Center, since the time error of Guangzhou Traffic Service Center is very small, and could be neglected, therefore, the time showed in night vision video of "San Bu" after adding 3 minutes is the accurate time. However, the accident time provided by the Master of San Bu (about 1945hrs) was not accurate; deck officer of Yue Guang Zhou Huo 0217 could not provide an basically accurate accident time. To sum up, the accident time is 1953hrs 40″.

2.2.2 Collision location

By the statement of the master, duty deck officer of San Bu, the accident location was at the waters oppositely off Panlong oil reserve Fuliangang Waters Panyu, Guangzhou, the accurate place could not be provided.

By the statement of duty officer of Yue Guang Zhou Huo 0217, the accident location was about 500meters upstream to Panlong oil reserve, Fuliangang Waters Panyu, Guangzhou, the accurate place could not be provided.

The video of Guangzhou Traffic Service Center showed, at 1953hrs 40″, GPS position of San Bu was 22°55′ .456N/113°30′ .227E, which was about 140 meters upstream to Shabei ferry of Fuliangang waters.

To sum up, GPS position of San Bu showed by video of Guangzhou Traffic Service Center 22°55′ .456N 113°30′ .227E is the accident place.

2.2.3 Analysis of the relative movement of both ships

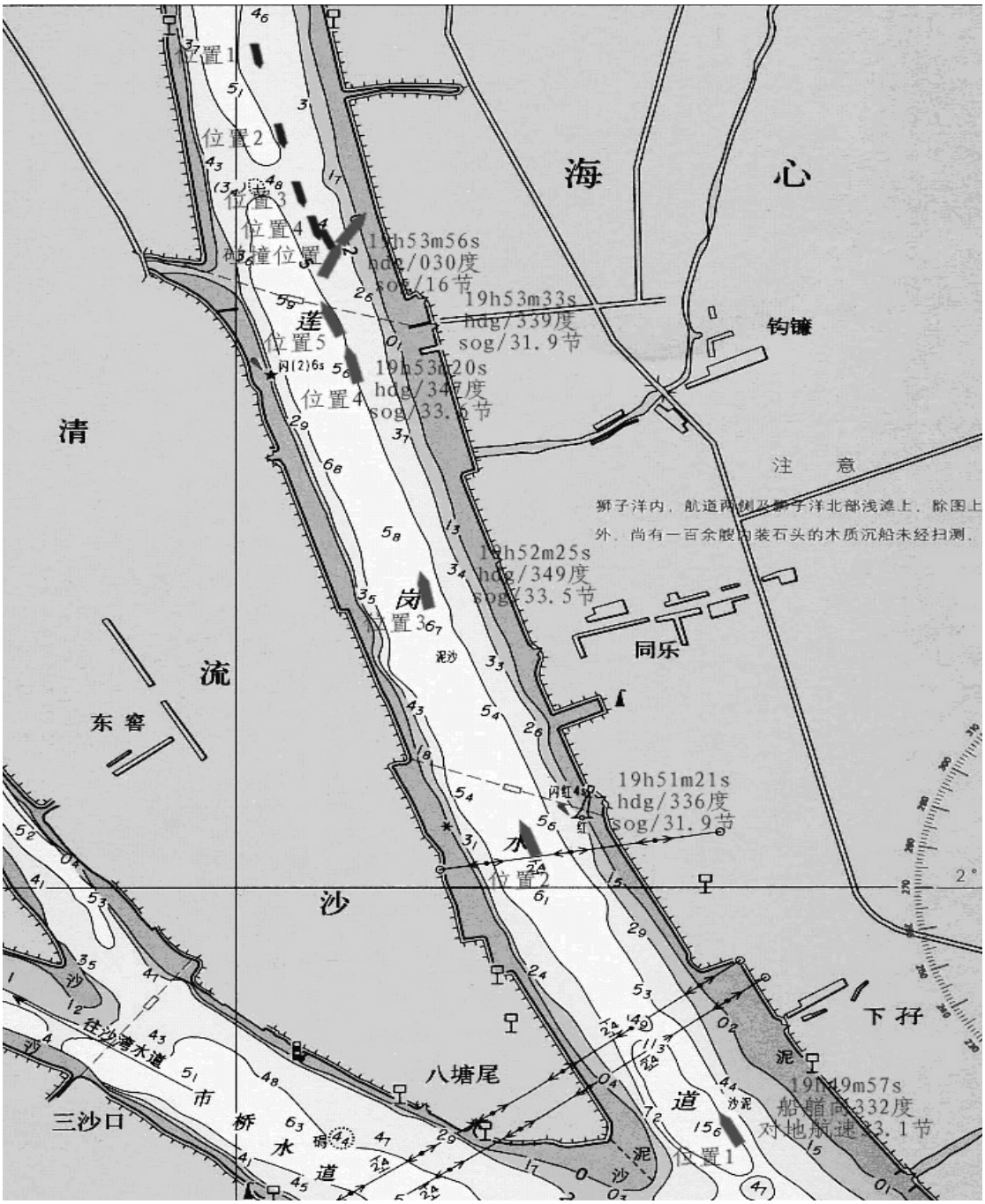
The first time when master of San Bu spotted the small vessels ahead of him, he observed their red lights, masthead lights, and vaguely the green lights; at that time, the vessel was proceeding on the right side of Fuliangang water channel, making good a speed of about 33.5knots.

On board Yue Guang Zhou Huo 0217, which was the third one navigating oppositely ahead of San Bu, the duty deck officer first saw San Bu and both her sidelights, as Yue Guang Zhou Huo 0217 was proceeding on her left side of the Fuliangang Water channel, making good a speed of 6-7 knots.

Based on the above facts, it could be determined that the two ships were approaching on an opposite course and were heading into collision risk. According to article 17 of Safety Management Regulations for High speed craft of P. R. China, the high speed craft sailing in the navigable port

waters shall give way to the non-high speed crafts; therefore, San Bu was the ship in this case to give way to Yue Guang Zhou 0217.

2.2.4 Collision diagram



2.4 SEQENCE OF EVENTS

The sequence of events were based on the collision accounts given by crews of both ships, the night visual video tape, VTS record of Guangzhou VTS, etc.

2.4.1 San Bu

At 1810hrs 5th November 2009, San Bu left China Hong Kong SAR for Panyu Lianhuashan Passenger wharf, Guangzhou, with 75 passengers and 9 crews on board. At the time of departure, the forward draft was 1.10meters, aft draft was 1.30meters.

After the ship departed, there were 5 persons on bridge, the master was at the main maneuvering console panel in charge of the navigation, the C/E was at left console monitoring the main engine performance, the C/O was at the right side of the bridge (between the master and the night vision observer) observing the radar, the night vision observer at the right side of the bridge observing the night visual observing equipment, one A/B was at the bridge assisting look-out.

Two radars were working on bow upwards, relative movement, off center display, two VHF were on, one GPS was on, AIS was on, and navigation lights was on as well. Prior departure, all the onboard navigation equipments were checked according to procedures, all were in normal condition. After departure, two main engines were on joint operation and were controlled by the left side main joystick, including the rotation rate and propulsion direction, while joint control joystick at the right side of the duty officer controlled the ship's rudder angle (by controlling waterjet direction to adjust ship's moving direction).

The master was in charge of the navigation the way from China Hong Kong SAR to Zhong Gu Waters, Humen Bridge to Lianhuashan Passenger Transport, the C/O observed the radar; the way from Tong Gu Waters to Humen Bridge was navigated by C/O, the master observed the radar.

At about 1905hrs, the weather was fine, the visibility was good, light ebb, no breeze, the craft entered Fuliangang Water channel, proceeding slightly to the right side of the middle line of the waterway, making good a course of 330° and a speed of about 33 knots.
At 1950hrs 22″, the craft passed with a small vessel port to port.
At 1951hrs 15″, shortly after the craft overtook a sand carrier, she arrived the waters off Panlong Oil Reserve, the master observed 3 small vessels ahead, all showing red lights, masthead light and vaguely green lights; thus her red lights were flashed, the nearer two small vessels responded with red flashing lights, agreed to pass port to port.
At 1953hrs 02″, San Bu passed with the first small vessel port to port, lateral distance was about 20 meters.
At 1953hrs 15″, the vessel arrived near to Fuliangang Shabai ferry, passed with the second small vessel port to port, the lateral distance was about 20 meters. After passing with the second small vessel, the vessel showed green flashing light, requesting to pass starboard to starboard with the third small vessel which was 350 meters distant then (Yue Guang Zhou Huo 0217). Accordingly the master at once used the joint operation mode to slightly turned San Bu to portside, adjusted the course from 346° to 335°.

At 1953hrs 27″, the right waterjet malfunctioned and triggered alarm, RPM of which decreased from 1850 to about 1600, the craft's speed decreased gradually from 33.5 knots and her heading turned to starboard abruptly. The master immediately engaged the spare waterjet control system and then quickly disengaged, with a view to eliminating the alarm, but came to no effect. Then the master changed the joint operation mode to separate operation mode, engaged and quickly disengaged the spare waterjet system, and then the alarm was eliminated. By then the right main engine RPM was down to 1400 RPM, the bow kept turning starboard; the master increased the RPM of right engine and put the left engine astern, trying to turn his ship to port.

At 1953hrs 40″, sooner than the craft's heading started turning port as the right main engine RPM was increased, the port middle of the lower passenger deck collided with the conveyer at the bow of Yue Guang Zhou Huo 0217, at an angle of about 30°, the conveyer penetrated into the lower passenger deck, by the effect of inertia, 3 pillars at the port isle collapsed, some of the seats at the middle of the passenger deck were turned up side down, 1 passenger died instantly, 10 passengers injured (1 was dead after transferred to hospital), the front part of conveyer broke off, deformed.

2.4.2 Yue Guang Zhou Huo 0217

At 1555hrs 5th November 2009, Yue Guang Zhou Huo 0217 loaded 138 tons of coal at Xiji wharf Xingang Guangzhou Port and left for Yong Long Water Factory Shigang Panyu Shiqiao Guangzhou, the forward and aft draft at departure were 1.6 meters and 1.8 meters respectively.

Shortly after departure, the vessel anchored for some while. After one hour of anchor, she resumed her voyage. The deck officer Lin Wang Xing was on duty at the bridge, 1 VHF was turned on channel 8, the navigation lights were on, the rate of the main engine was 1000 RPM, the speed was about 6-7 knots.

At about 1900 hrs, the vessel entered Fuliangang water channel.

When the vessel arrived in the water near Guan Chong Kou, the duty officer Lin Xing Wang observed a vessel ahead near to Pan Long Oil Reserve showing both side lights, and also saw the empty area between the vessel's bottom and the line, realizing she was a high speed passenger craft (later known as San Bu).

Soon after, the vessel arrived area about 200 meters upstream to Sha Bei Ferry of Fuliangang Water channel, the duty deck officer Lin Xing Wang observed the approaching high speed craft was showing green flashing light, realizing the coming vessel request to pass starboard to starboard with her vessel, thus she accordingly put her rudder port 10° ~ 15°. When the distance between two vessels was down to 150 meters, duty officer Lin Xing Wang found the high speed craft abruptly turning right, heading directly toward her own vessel, then she put rudder to starboard and slowed the engine, but sooner than the actions came to any effect the collision happened. The conveyer that extend outward her bow penetrated into the passengers hold of the high speed craft, and by inertia the conveyer caused further damage in the passenger deck and itself broke off and deformed.

2.5 CAUSES

San Bu did not navigate according to relevant regulations and did not adopt safety speed, her right main engine suddenly reduced speed, resulting at the vessel turned to the starboard, and the improper operation of both vessels are the direct causes of the accident.

2.5.1 San Bu

2.5.1.1 When sailing in the complicated waters, company's safety management procedure was not followed.

When the vessel enters Fuliangang water channel, which is narrow and the traffic is heavy, the master should operate his two main engines separately to improve the maneuvering ability in heavy traffic and complicated waters, to be more flexible to avoid vessels, but he did not operate according to requirement and still used joint operation mode which resulted at less rudder effect and less flexible operation.

2.5.1.2 San Bu did not navigate at safety speed in complex water area, no good seamanship was kept to avoid collision.

When the vessel arrived area near off Pan Long Oil Reserve of Fuliangang water channel, she decided to pass port to port with the first two approaching small vessels. While regarding the third approaching small vessel (later known as Yue Guang Zhou Huo 0217), no collision avoidance signal lights was agreed, which meant there was collision risk; under these circumstance the master should decisively reduce the speed in order to leave enough time to estimate the collision risk and take avoidance action, but the vessel did not reduce the speed, rather flashed the green light to pass starboard to starboard with the third vessel. By doing this, the high speed craft, sailing in the narrow water channel with very high speed, avoided the first two vessels via passing port to port, then chose to pass the third starboard to starboard, this was contrary to the Ordinary Practice of Seaman and the good seamanship that described in article 6 & 8 of COLREG1972.

2.5.1.3 The right waterjet propulsion system malfunctioned, the emergency reaction of the master was improper.

When San Bu was turning port to pass starboard to starboard with the third small vessel, the right water jet suddenly malfunctioned, and then the master chose to eliminate the failure alarm first.

According to company's safety management system documents, it is possible that the water jet may malfunction when ship is navigating; the master's statement also shows that in the actual practice there had been failure of the water jet. Therefore, it was predictable that the water jet system may have failure when ship is navigating; it was not a force majeure.

The correct reaction to the right waterjet malfunction is to at once put the two main engines on separate control, then slow the left one to keep the two main engines balanced. What the master actually did in response was improper, and had not helped to avoid the collision.

2.5.2 Yue Guang Zhou Huo 0217

2.5.2.1 Improper look-out

In order to pass safely with the three small vessel that navigating oppositely ahead of her, San Bu flashed her red light requesting to pass port to port; the first two small responded by flashing back red lights and agreed to pass port to port; while the third one (Yue Guang Zhou Huo 0217), under the circumstance of good visibility, did not observe San Bu showing red flashing lights and did not take measures as the first two vessels did to pass port to port with San Bu, which shows no proper lookout was kept on board Yue Guang Zhou Huo 0217.

2.5.2.2 Had not kept to her starboard side of the channel, then involved into collision danger with San Bu.

Fuliangang Water Channel is a typical narrow water channel, vessel sailing in narrow water channel shall keep as much to the starboard side of the channel as practically safe; while Yue Guang Zhou Huo 0217 did not follow this rule.

2.6 OTHER FINDINGS

2.6.1 The rules applicable to the accident channel

The applicable rule to the accident channel is 1972 COLREG, and based on that the actions of crews are judged. But inland river ship deck officers training course does not include 1972 COLREG; neither does the authority publicize specific relevant requirements, therefore, the propriety of applying 1972 COLREG in the accident channel is disputable.

2.6.2 The accident vessels

2.6.2.1 The navigation system malfunction, alarm and the sudden diminish of speed of the high speed craft.

The sudden malfunction of one main engine during normal navigation and results at RPM reduction of one main engine, which further results at heading turning undesirably, had been a publicly known navigation hazards. This safety issue still needs further and study and research.

2.6.2.2 The outward extending conveyer of Yue Guang Zhou Huo 0217

The length of Yue Guang Zhou Huo 0217 is 30m, the conveyer at the bow is fixed and could not move, the outward extending length is 15m, which is 1/2 of ship's total length; when ship sailing in night, especially in inland river, the passing distance between vessels is close, while the conveyer could not be observed earlier creates the hidden danger. Only by preliminary statistical, in 2008 and 2009, there were 13 similar conveyer accidents.

2.6.2.3 The speed limit in the accident channel

At the time of collision, Guangzhou Fu Lian Gang water channel had no publicized speed limit.

2.6.2.4 VDR on high speed craft

The high speed passengers craft San Bu does not have VDR; neither does the relevant regulation require it. This poses a great challenge to the post-accident investigation.

2.7 RECOMMENDATIONS

The operator and manager of San Bu is recommended to installs video surveillance systems and inspect the deck officer's on board operation periodically, in order to ensure the on board compliance with safety management procedures.

The local maritime safety administration is recommended to require the high speed passenger craft to install onboard VDR, to require the redesign of the conveyer of the inland river cargo vessel in order to minimize the collision hazards, to study and research the sudden waterjet malfunction and its safety implication of high speed passenger craft.

The local maritime safety administration is recommended to enforce speed limit in the Fuliangang channel, to train the inland river vessel deck officers with 1972 COLREG.

（中華人民共和国香港特別行政区）

Report of investigation into the Collision between the Hong Kong Registered ship "Hebei Spirit" and Korean Crane Barge “Samsung No. 1” on 7 December 2007

The Hong Kong Special Administrative Region
Marine Department
Marine Accident Investigation Section

Purpose of Investigation

This incident is investigated, and published in accordance with the IMO Code for the Investigation of Marine Casualties and Incidents promulgated under IMO Assembly Resolution A.849(20). The purpose of this investigation conducted by the Marine Accident Investigation and Shipping Security Policy Branch (MAISSPB) of Marine Department is to determine the circumstances and the causes of the incident with the aim of improving the safety of life at sea and avoiding similar incidents in future.

The conclusions drawn in this report aim to identify the different factors contributing to the incident. They are not intended to apportion blame or liability towards any particular organization or individual except so far as necessary to achieve the said purpose.

The MAISSPB has no involvement in any prosecution or disciplinary action that may be taken by the Marine Department or others resulting from this accident.

Table of Contents

1. Summary

1.1 On 7 December 2007 at about 0706, a collision incident occurred between a crane barge *"Samsung No 1"* and the Hong Kong registered very large crude oil carrier (VLCC) *"Hebei Spirit"* in the vicinity of Daesan, Korea at position 36◦52.3'N 126◦03.1'E. At time of the incident, the crane barge was towed stern first by the tugs *"Samho T-3"* and *"Samsung T-5"*. A smaller anchor boat *"Samsung A-1"* was escorting at the other end of the barge. Weather conditions were reported as poor.

1.2 *"Hebei Spirit"* was carrying 263,541 tonnes of crude oil. It was anchoring at a position instructed by Daesan vessel traffic information station (VTIS) off Daesan waiting for discharge at time of the incident. Before collision, the tugs lost control of the crane barge in rough weather and somehow drifted toward the *"Hebei Spirit"*. After the crane barge had passed off the bow of the *"Hebei Spirit"*, one of the towing wires parted when the crane barge was in close vicinity of the VLCC. As a result the crane barge made contact with the VLCC at the port side of Nos. 1, 3 and 5 cargo tanks causing severe oil pollution to the sea area.

1.3 Anti-pollution measures were immediately taken on board *"Hebei Spirit"* to reduce the spillage. The crew transferred cargo oil from the ruptured tanks into centre and starboard tanks and rigged collision mats to cover the rupture as an attempt to slow down the spill. Oil boom was also rigged from the vessel trying to contain the spillage of oil. Despite the measures taken, an estimated amount of about 10,900 tonnes of cargo oil had spilled into the sea.

1.4 The investigation revealed that the decision to commence the towing voyage when adverse weather had been forecast is the main contributory factor of this accident. Other causes of accident were loss of control of the towing convoy in rough weather and delaying of notice to the VTIS and other vessels in the area by the tow Master.

2. Description of Vessels

2.1 *"Hebei Spirit"* (fig. 1)

2.1.1	Port of Registry	:	Hong Kong
	IMO No.	:	9034640
	Type	:	Very Large Crude Oil Carrier (VLCC)
	Date of Built	:	1993
	Gross Tonnage	:	146,848
	Deadweight	:	269,605
	Length Overall	:	338.00 m
	Breadth	:	58.360 m
	Summer Draft	:	19.16 m
	Main Engine	:	1 x Oil Engine driving 1 Fix Pitch propeller
	Engine Power	:	20,580 kW @ 68 rpm
	Speed	:	15.5 knots

2.1.2 *"Hebei Spirit"* is a single hull VLCC. The bridge of *"Hebei Spirit"* is equipped with modern navigational aids including gyro and magnetic compasses; 2 radars both of which are fitted with automatic radar plotting aids facilities and 2 global position satellite navigators. The ship is fitted with two bow anchors, each weighing 15 tonnes, and connected to anchor cables with links of 111 millimetres diameter chain and 14 shackles (384 metres) in length**.** *"Hebei Spirit"* was manned in accordance with the requirements of the Minimum Safe Manning (MSM) Certificate issued by the Marine Department of Hong Kong SAR with 27 crew on board.

Fig.1 Hebei Spirit

2.2 *"Samsung No. 1"* (fig. 2)

2.2.1	Type	:	Ocean Crane Barge
	Registered Port	:	Geoje-City, Korea
	Displacement	:	11,828 tonnes
	Length Overall	:	105.63 m
	Breadth	:	45.0 m
	Depth	:	7.0 m
	Built	:	Samsung Heavy Industry
	Date Launched	:	June 1995

2.2.2 The crane barge *"Samsung No. 1"* is a non-propelled vessel equipped with one GPS and one VHF equipment. The barge was also fitted with one windlass with chained anchor, four other pieces of anchor for other special purposes and five lengths of mooring wires (42.5 mm x 400 metres). *"Samsung No. 1"* has a maximum lifting capacity of 3,000 tons. At time of the accident, the barge was under tow and proceeding to its home port of Gohyun in Geoje after completion of the work at the Inchon Grand bridge construction site. The Master of "*Samsung T-5"* was the person in charge for the intended towing voyage.

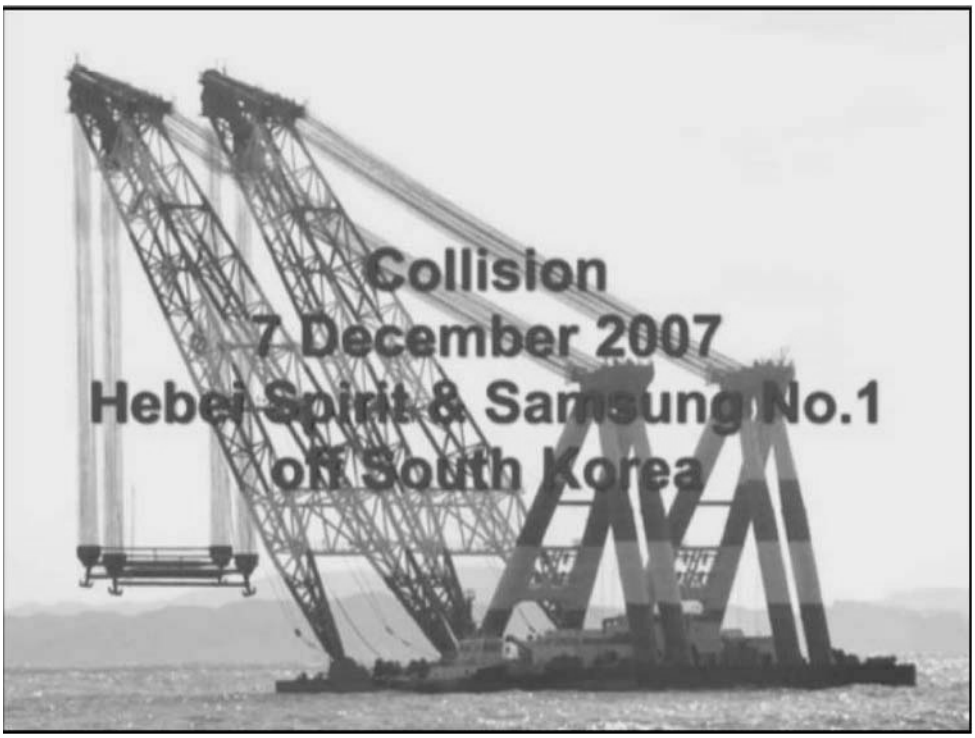


Fig. 2 The crane barge *"Samsung No. 1"*

2.3 *"Samho T-3"*

2.3.1	Type	: Tug
	Deadweight	: 182 tonnes
	Length Overall	: 33.8 m
	Breadth	: 9.4 m
	Depth	: 4.15 m
	Built	: 2006
	IMO number	: 9413169

2.3.2 At time of the accident tug *"Samho T-3"* was towing the crane barge *"Samsung No.1"* by the stern at its portside. The towing wire was 48 mm diameter at a towing length of 400 metres. *"Samho T-3"* was powered by 2 oil engines driving 2 Z propellers at 220 rpm, total power rating was MCR 2,644 kW (3,594 hp), CSR 2,246 kW (3,052 hp) with a maximum speed of 13 knots.

2.4 *"Samsung T-5"*

2.4.1	Type	: Tug
	Deadweight	: 311 tonnes
	Length Overall	: 39.6 m
	Breadth	: 10.0 m
	Depth	: 4.6 m
	Built	: 1995
	IMO number	: 9140889

2.4.2 "*Samsung T-5"* was powered by 2 oil engines driving controllable pitch propellers with total power at MCR 3,530 kW (4,800 hp). *"Samsung T-5"* was engaged in towing the crane barge by the stern at its starboard side. The towing wire was 48 mm diameter at a towing length of 420 metres. The Master of tug *"Samsung T-5"* assumed the overall responsibility on navigational safety of the convoy when *"Samsung No. 1"* was under tow.

2.5 "*Samsung A-1"*

2.5.1 "*Samsung A-1"* is a relatively small size anchor boat at about 89 tons. The anchor boat was used for conveyance of personnel and light equipment between the tugs and the crane barge.

3. Sources of Evidence

3.1 *"Hebei Spirit"* - The Master, Chief Officer and the crew

3.2 Lawyer and Operator of *"Hebei Spirit"* – "Ince & Co. International Law Firm" and "V. Ships"

3.3 Korean Maritime Safety Tribunal (KMST)

3.4 Through the assistance of the Korean Maritime Safety Tribunal (KMST) and the lawyer of *"Hebei Spirit"*, information concerning *"Samsung No. 1"* was obtained. At the time of investigation in Daesan, the investigating officer was not able to contact the crew of the *"Samsung No. 1"* as well as from the other 3 tugs involving in the incident, as they had been taken custody by the Korean police.

4. Outline of Events

4.1 Account of *"Hebei Spirit"*

4.1.1 *"Hebei Spirit"* arrived at Daesan late in the afternoon of 6 December with 263,541 tonnes of cargo on board. *"Hebei Spirit"* were carrying a full cargo, with all the cargo oil tanks loaded to 98% capacity, except the Nos. 3 and 5 centre cargo oil tanks, which were 96.5% full. The vessel was on even keel with arrival drafts of 19.98 metres. At 1718 local time, (Greenwich Mean Time +9 hours), Daesan Vessel Traffic Information Service ("VTIS") informed *"Hebei Spirit"* over the VHF radio Channel 12 to proceed to anchor in a position 4.6 nautical miles to the west of the No.1 red flash buoy. *"Hebei Spirit"* had been to Daesan four times previously and on each of these visits she was directed by the VTIS to anchor at or about the same position.

4.1.2 The Master gave the order to let go the starboard anchor at 1918 when in position 36°52.3'N 126°03.1'E. About 5 nautical miles west south west from the light beacon (with Racon "G" identification, flash green at 6 seconds intervals, range 13 nautical miles). The position was taken from the Global Position System device and plotted on the chart. The heading on letting go the anchor was 073°Gyro, and the water depth was about 64 metres. The wind was north-easterly force 5 and the tidal current was setting in a south-westerly direction at a rate of 2 knots.

4.1.3 The anchor was brought up with 9 shackles (247 metres) on deck, 8 shackles in the water. The anchor lights and deck floodlights were switched on and navigational lights were turned off. There are two anchor lights on the *"Hebei Spirit"* because of her length, one at forward and one aft. The deck flood lights were also switched on as required under the International Regulations for the Prevention Collisions at Sea, 1972, as amended. In addition, the red signal light indicating carriage of dangerous cargo was also switched on.

4.1.4 At 1924 of 6 December 2007, the Master reported the anchorage position to the VTIS. The VTIS informed that the pilot would be boarding at 1400 on 7 December to take the vessel to the Single Buoy Mooring at Daesan Hang about 20 nautical miles to the North-East, where the vessel would discharge the cargo. The Master informed the Chief Engineer accordingly and the engine was shut down on one hours notice for manoeuvring. One of the steering motors was turned off. The Master kept one steering motor running at this anchorage, because the relatively strong current could cause the rudder to move around if the power was switched off.

4.1.5 The Master left the bridge leaving the Third Officer and 4-8 duty Able-Bodied Seaman (AB) on anchor watch on the bridge. The Master made several brief visits to the bridge with the last visit at 2115. The Master wrote the Night Orders that the watch-keeping officers should follow the company anchor watch standing orders, and call the Master if they had any concerns or required his attendance. The Master stated that he checked the weather forecast on the Satellite-C system and there were no gales forecast specifically for this area before he left the bridge.

4.1.6 In the morning of 7 December 2007 at about 0605, the Chief Officer called the Master to the bridge telling him that a tow was causing concern because it was shaping up to pass only 0.3 nautical mile ahead of the vessel. There were two other anchored vessels in the vicinity but more than 2 nautical miles away with bearing between 045°Gyro(G) and 090°G. There was therefore, plenty of navigable sea room all around *"Hebei Spirit"*.

4.1.7 The Master arrived the bridge at about 0606. The Master thought it was unnecessarily dangerous for the tug and tow to pass ahead with only 0.3 nautical mile away from *"Hebei Spirit",* a loaded very large crude carrier (VLCC), when there was plenty of sea room to pass astern and at a greater distance. The Chief Officer was standing by the radars, and the Deck Cadet, who was on 4-8 duty lookout that morning, was standing by the gyro compass repeater at the centre of the wheelhouse.

4.1.8 At that moment the *"Hebei Spirit"* was on a northerly heading. The weather had deteriorated over night. The wind was westerly on the port beam with wind speeds of 30 to 35 knots, Beaufort force 6 to 7. The sea was very rough and there was a short, moderate swell so that the vessel was taking spray over the port bow. The tidal current was setting in a southerly direction at the rate of more than 1 knot. The visibility was fair, more than 3 nautical miles.

4.1.9 A tug towing a large crane barge was visually observed from ahead, there was another tug close to the stern of the barge. There were 3 white masthead lights vertically in a line and a

red, port sidelight on the forward tug. The barge was very brightly lit. These lights indicated that the tug and tow unit was more than 200 metres long, and that the forward tug was less than 50 metres in length. The after tug was so close to the barge that it appeared to be pushing the barge. From their lights, the tugs and barge were on a crossing course, heading in a south-westerly direction.

4.1.10 The Master then sounded more than 5 blasts in quick succession on the forward whistle and checked the radars to see how far away the barge was. The Chief Officer had already acquired the target of the barge on the ARPA on the port radar, and the target of the forward tug on the ARPA on the starboard radar. The barge was making good a course of about 240 degree to 280 degree moving slowly. The closest point of approach was 0.3 nautical mile.

4.1.11 The Master instructed the Deck Cadet at about 0614 to call the tugs and barge on VHF radio Channel 16 and ask them what their intentions were, and to keep clear of *"Hebei Spirit"*, but they did not reply. As they did not reply the Master told the Deck Cadet to inform the VTIS that the tugs and barge were passing very close to *"Hebei Spirit"*. In reply, the VTIS told *"Hebei Spirit"* to stand-by.

4.1.12 At this time there were no other targets close by on the radar. The nearest anchored ship was 1.8 nautical miles away to the east and on the starboard side, bearing just abaft the beam. It was clear that there was a risk of collision with the projected path of the tug and tow. The barge was crossing close ahead and the closest nearest point of approach on the radar was 0.3 nautical mile to port. A passing distance of 0.3 nautical mile ahead would mean that the barge would pass only 0.15 nautical mile i.e. less than 300 metres ahead of the bow of the ship after taking into account the location of radar and the length of the *"Hebei Spirit"*. The Master was also concerned by the fact that the tug was not answering the calls on the VHF radio.

4.1.13 The Master called the Chief Engineer to get the engine ready for manoeuvring as quickly as possible. At this time, the Master also told the Chief Officer and the anchor party to go forward. The Chief Officer and duty AB were both on the forecastle by about 0617. The Chief Officer checked the direction of the anchor cable and reported to the bridge that it was almost in an up and down direction. On acknowledging the direction of anchor cable, the Master decided to give the engine a kick astern to get the ship moving backwards, and at 0617, the Master put the engine to dead slow astern.

4.1.14 Whilst slacking back on the cable at 0622, the VTIS called on the VHF radio on Channel 12 and asked *"Hebei Spirit"* to pick up the anchor to avoid collision with the barge. At this time the barge was bearing about 10 on the starboard bow and was only 0.5 nautical mile away on the radar, 0.35 nautical mile from the bow. If the anchor cable were heaved, the ship

would move ahead, towards the barge thereby increasing the risk of collision. The Master considered the barge was too close and it would be unsafe to heave up the anchor at this time.

4.1.15 The Master informed VTIS that the vessel was paying out the anchor chain and going astern on the engine. He continued to give the engine short kicks astern to 12 shackles (330 metres) in the water. The Chief Officer stopped slacking back and held on to the cable to keep a short length of cable in the chain locker in case it became necessary to slip the anchor cable. At 0632, the barge was now right ahead. Thereafter, her bearing began to open as the barge crossed onto the port bow, the distance between the VLCC and the tug and tow slowly started to increase.

4.1.16 As the Master continued to watch, it was observed that the barge was getting closer to the vessel again. With a steady bearing and decreasing range it was clear there was a risk of collision with the barge moving towards the vessel. The Master put the engine to dead slow astern, followed quickly by slow astern and half astern. At 0658, the Master told the Chief Officer to slip the starboard anchor cable. A short while later the Chief Officer reported to say he was having difficulty hammering out the securing pin.

4.1.17 The barge was now almost upon the port forward of *"Hebei Spirit"* and the crane jibs and hooks were swinging dangerously close above the forecastle deck. The anchor party quickly left the forecastle. With collision imminent, the Master sounded the general alarm and directed the Chief Officer to return aft with the anchor party.

4.1.18 The barge struck the port side in way of the No.1 port cargo oil tank at 0706, and the crane hooks damaged the foremast. Then later the barge made contact again, striking the portside in way of the No.3 port cargo oil tank. With the foremast damaged, fearing some of the electrical wiring forward could be short circuited with spark that might lead to explosion, the Master ordered the anchor lights and deck floodlights to be switched off for safety reasons. Then later the barge made contact again, striking the portside in way of the No.5 port cargo oil tank.

4.1.19 After the first contact scrapped down the port side, at 0721 in an attempt to avoid further contacts, the Master put the engine to dead slow ahead as an effort to swing the stern away from the barge, which was at the engine room position. Shortly thereafter, the barge passed by the bridge, and in doing so the crane hooks struck the main mast at the aft causing further damage, including the satellite communication antenna dome (fig.5).

4.1.20 As the barge passed clear astern, the Master received reports of oil leaking into the sea from the damaged Nos. 1, 3 & 5 port cargo oil tanks. He contacted the VTIS on VHF

Channel 12 and informed them what had happened and reported the pollution. The time was 0728. The Master also broadcast at 0730 on VHF Channel 16 a navigational warning of the pollution.

4.1.21 *"Hebei Spirit"* was not able to report the accident to the shipowners at the time because the crane hooks of *"Samsung No. 1"* had damaged the satellite communications dome on the main mast in the collision. On acknowledging the leakage of oil, the ship's crew implemented the ship's emergency response plan for dealing with an oil pollution incident. They checked the ullages of all the cargo oil tanks, and sounded all the ballast tanks and void spaces to make sure the only leaks were in way of the Nos. 1, 3 & 5 cargo oil tanks. The Chief Engineer reported that there were no leaks in the engine room tanks (fig.3).

Fig. 3 *"Hebei Spirit"* after collision

4.1.22 With the strong wind on the port beam and the rough seas, the vessel was taking spray with the oil leaking out dispersed all over forward part of the deck. The vessel was listing noticeably to starboard. The crew also rigged collision mats at side of the damaged cargo oil tanks in an effort to reduce the amount of escaping oil went overboard.

4.1.23 At 0938, representatives from the Korean Coast Guard were winched down on to the main deck of the ship by a helicopter for assessing the leakage and damages. It was ascertained that the leaks were confined to Nos.1, 3, & 5 cargo oil tanks (fig. 4). As *"Hebei Spirit"* were carrying a full cargo with almost all the cargo oil tanks were loaded to 98% capacity, with the exception of Nos. 3 and 5 centre of 96.5% full, the vessel had very little tank space available

to safely transfer any of the cargo internally between the cargo oil tanks. It was also impossible, owing to the tank and piping configuration, to transfer cargo into the ballast tanks and void spaces. The worst leak at this time was in way of the No.5 port cargo oil tank and in light of the emergency, the Master ordered the Chief Officer to begin transferring the cargo from the breached tanks into Nos. 3 & 5 centre cargo oil tanks.

Fig. 4 Damaged No. 1 port cargo oil tank

Fig. 5 Damaged satellite communication dome at the main mast

4.1.24 Before transferring the cargo, and for safety reasons, inert gas was pumped into the cargo oil tank, and particularly into the leaking cargo oil tank where the inert gas pressure had fallen to reduce the risk of explosion. The crew started transferring the cargo from No. 3 port cargo oil tank to Nos. 3 and 5 centre cargo oil tanks. In order to reduce the quantity of oil ultimately escaping into the sea, the Chief Officer started ballasting into the starboard side ballast tanks. The vessel took in about 3,000 tonnes of ballast, by the time the list was then about 5 to 6 to starboard. The Master could not further increase the list because of the slippery conditions on deck and the dangers to the crew. After 1115 only oil from the No.1 port cargo oil tank was leaking at a rate of about 250 barrels per hour. The oil finally stopped leaking from this tank at 2000 on 8 December.

4.2 Account of the Towing Convoy

4.2.1 At the time of investigation in Daesan, the investigating officer was not able to contact the crew of the crane barge *"Samsung No. 1"* as well as from the other 3 tugs involving in the incident, as they had all been taken custody by the Korean police. Information concerning the towing convoy was obtained through the assistance of the Korean Maritime Safety Tribunal (KMST) and the lawyer of *"Hebei Spirit"*.

4.2.2 The towing convoy departed on its return voyage from Inchon at about 1450 on 6 December 2007 after work and headed south for Geoje (34◦49'N 128◦26'E). The crane barge *"Samsung No. 1"* was towed by the stern by two tugs, namely *"Samho T-3"* and *"Samsung T-5".* An anchor boat "*Samsung A-1"* was escorting at the other end of the crane barge (fig. 6). The towing wires at tug *"Samho T-3"* was approx. 400 metres and *"Samsung T-5"* was approx 420 metres. Both towing wires were at 48 mm in diameter. The Master of *"Samsung T-5"* had assumed the overall responsibility on navigational safety of the convoy. During the voyage, the communication between the four vessels was through VHF radio Channel 15 and occasionally via mobile phones.

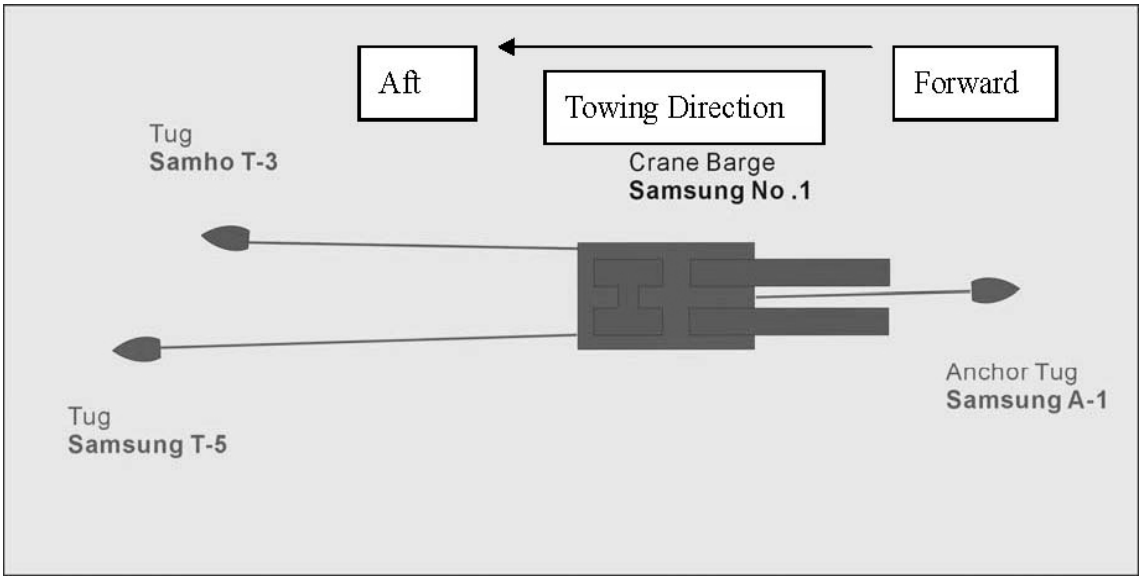


Fig. 6 Towing arrangement of the convoy

4.2.3 A towing capability inspection was carried out on 26 November 2007 in Busan before the voyage to Inchon. Voyage recommendations stipulated that the towing convoy is not to depart if winds in excess of Beaufort scale force 5.

Information on weather forecast

4.2.4 There was a discussion in the morning of 6 December 2007 between the Master of barge *"Samsung No. 1"* and *"Samsung T-5"* regarding the departure of the towing convoy. The Master of the barge *"Samsung No. 1"* received information that the weather was not so good. He also received a text message from the office that the wind would be from southwest to west and the wave height would be about 1.5-2.5 metres (Beaufort scale force 4-6). He passed the information to the Master of *"Samsung T-5"* but he played no part in deciding whether the voyage should be commenced in view of the weather condition.

4.2.5 The Master of *"Samho T-3"* also heard the weather information about 1 hour before departure that the weather was not that good on the day of 6 December 2007 and would become even worse the next day. Although he had received the adverse weather information, he did not contact the Master of *"Samsung T-5"* or barge *"Samsung No. 1"*, instead he only discussed with his crew onboard *"Samho T-3"*. He stated that he was not responsible in making the decision whether the towing voyage should go ahead.

4.2.6 The Master of *"Samsung T-5"* considered that the weather forecast would not affect the voyage of the towing convoy because the wind at that time did not reach Beaufort Scale 5. He also considered that the strong wind forecast was for the sea areas of 20 miles from the

shore. The voyage of the towing convoy was planned to navigate only 10 miles away from the coast.

The towing voyage

4.2.7 The towing convoy departed at about 1450 on 6 December 2007 from Inchon Grand Bridge construction site and headed south for Samsung Heavy Industry located at Gohyun port in Geoje (34◦49'N 128◦26'E). Anchor boat *"Samsung A-1"* was positioned close to the forward of the crane barge. The average speed of the towing convoy was about 3.5 knots.

4.2.8 At about 0200 on 7 December 2007 the Master of *"Samsung T-5"* went to the steering room and notified the deteriorated weather condition. He changed the course to 250 degree.

Loss of control over the towage

4.2.9 As the weather deteriorated in the morning of 7 December 2007, the crane barge started losing control and the towing convoy was moving in a zigzag direction, deviating from its intended course. At around 0400 hours the towing convoy was virtually out of control as it drifted in a south-easterly direction. The speed dropped down to 1.7 knot, at this slow speed the barge would be further susceptible to drift under the strong wind.

4.2.10 Due to the poor weather situations, the towing capability of the towing convoy could not overcome the weather conditions. The Master changed its course from west to a northern direction at about 0444 trying to seek shelter by returning to Incheon Port but without success. After changing the course, the towing convoy was further drifted to south (fig. 7).

4.2.11 At about 0550 the Master of *"Samho T-3"* observed a huge target on the radar and was getting closer suggesting a risk of collision might exist. This target was later identified to be *"Hebei Spirit".* At 0630 the towing convoy continued to drift down and passed the bow of *"Hebei Spirit"* uneventfully from a distance of 0.7 nautical mile. After passing, the tugs increased the engine power, probably in an attempt to clear from *"Hebei Spirit"*. However, the towing wire of the *"Samsung T-5"* parted at about 0651 after the towing convoy passed the bow of *"Hebei Spirit"*.

4.2.12 The Master of *"Samsung T-5"* notified *"Samsung No. 1"* through the VHF radio that the tow wire was parted. The Master of the barge *"Samsung No. 1"* ordered his crew to drop the anchor to avoid collision with *"Hebei Spirit"* and he also requested another tug *"Samho T-3"* to pulled them away from the drifting path. Depth of water in the area varied between 30 to 66 metres. *"Samsung No. 1"* dropped the anchor at about 6 minutes before the collision. However even after the anchor was released with about 6 shackles (165 metres) of anchor chain in the water, due to the rough weather, barge *"Samsung No. 1"* continued to drift to the anchored position of *"Hebei Spirit".*

4.3 Communication between "*Hebei Spirit"* and Vessel Traffic Information Service (VTIS)

4.3.1 At 0609 on 7 December 2007 *"Hebei Spirit"* first called Daesan VTIS informing that a crane barge was fast approaching from a distance of 0.8 nautical mile ahead. After establishing communication the VTIS told *"Hebei Spirit"* that the crane barge would have difficulty to control its maneuver due to rough weather. The VTIS further requested *"Hebei Spirit"* to take some measures to cope with the situation. In reply *"Hebei Spirit"* informed that they were preparing to use the anchor and the engine.

4.3.2 At 0622, the VTIS called *"Hebei Spirit"* to use the engine and raise the anchor. However *"Hebei Spirit"* replied that there was no time to raise the anchor as the distance between them was only 0.3 nautical mile. If the anchor were heaved, *"Hebei Spirit"* would get closer to the crane barge and increase the chance of collision. Instead *"Hebei Spirit"* would go astern to increase the passing distance for the crane barge.

4.3.3 At 0652 the VTIS contacted *"Hebei Spirit"* asking them to pick up the anchor and move immediately to another safe place. *"Hebei Spirit"* reinstated the position that it would be difficult to raise anchor at such moment as the crane barge was still crossing ahead. This could only be safe to do so after the crane barge passed the bow of *"Hebei Spirit".*

4.3.4 The first collision occurred at about 0706. At 0716 VTIS asked *"Hebei Spirit"* if they could extend the anchor chain to the maximum and continued to move backward. *"Hebei Spirit"* replied that they had already done that. At 0719 *"Hebei Spirit"* requested VTIS to send a few tugs to help the situation that had been threatening their vessel. In reply VTIS said it would be difficult for them to do so because the location was too far away from their base. At 0720 *"Hebei Spirit"* reported that oil spills were observed. VTIS inquired about the damages of the vessel over the radio.

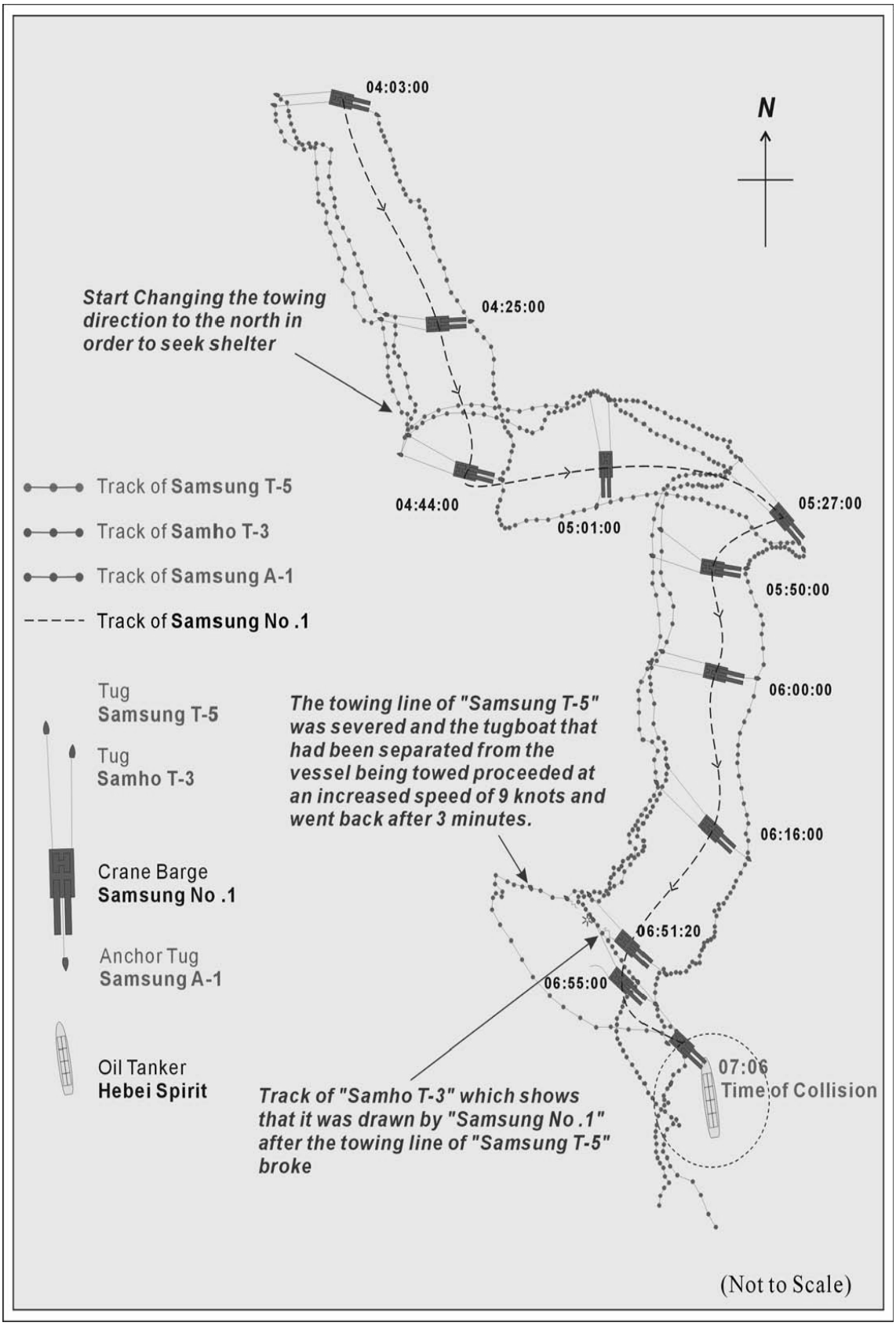


Fig. 7 Probable tracks of the towing convoy before collision

5. Analysis of Evidence

5.1 Weather Considerations

5.1.1 A towing capability inspection had been conducted about 10 days before the towing voyage. Amongst other conditions the inspection recommended that the tow was not to depart if winds were in excess of Beaufort scale force 5.

5.1.2 Before the towing voyage commenced, the Master in charge of the towing convoy had received adverse weather forecast. The forecast weather conditions would amount to Beaufort scale force 6 to 7. Poor weather would be anticipated in the waters around Daesan at around 0300 on 7 December 2007. Rough sea with northwesterly winds of 12 to 16 metre per second and waves at height of 2 to 4 metres would be prevailing in the area.

5.1.3 The Master however thought that the weather forecast of Incheon Port, i.e. the port of departure would not affect the voyage because the wind at departure did not exceed Beaufort Scale 5. Beaufort scale 5 was the limit to allow the towing to proceed set forth by the towing inspection. He also thought that the towing convoy would plan to navigate within 10 nautical miles from the coast. Despite the adverse weather forecast, the voyage however commenced at 1450 on 6 December 2007.

5.1.4 The Master in charge might have underestimated the severity of the rough weather that might affect the towing convoy. He also misinterpreted the effect of strong wind was only for the sea areas of 20 miles from the shore. The Master's decision to commence the voyage appeared to have been based on that the weather conditions at time of the commencement of voyage did not exceed the prescribed limit of Beaufort wind scale 5. He however, failed to take notice of the rough weather might further deteriorate during the voyage and did not make early preparation for rougher weather.

5.1.5 In practice, assessment of weather conditions should be based on a forecast of at least 48 hours period[1]. The Master should be aware that the forecast weather conditions after departure might exceed the prescribed limit as permitted by the towing inspection. He should have considered postponing the towing voyage until more favourable weather was expected.

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[1] "General Guidelines for Marine Transportations" by Noble Denton International

5.2 Towing conditions

5.2.1 In general tugs selected for a specific operation should possess suitable power to handle its tow under any condition that may be prevailing in a voyage. The tow should be of suitable draft, stability and freeboard for the intended voyage. Besides, specific attention should also be given to condition and maintenance of towing hawsers and towing gears.

5.2.2 As a general guidance, the following figures reflect the power of tug and related towing line sizes which have proven successful for numerous tows[2]:

Displacement of tows in tons	Tug towing power (hp)	Diameter of steel wire hawser
10,000 – 30,000	3000 to 5000	2 inches

5.2.3 The displacement of crane barge *"Samsung No. 1"* is 11828 tonnes, the power of the tugs *"Samho T-3"* and *"Samsung T-5"* is 2644 kW (3544 hp) and 3530 kW (4731 hp) respectively. The power of anchor boat "*Samsung A-1"* is relatively small. The size of towing ropes were 48 mm (1.89 inches) in diameter. Though appeared to be adequate, it applied only to towing under relative calm sea conditions.

5.2.4 In this incident, it appeared that the towing capability of the towing convoy could not overcome the weather condition during the voyage. The propulsion engine horsepower alone does not necessarily mean a tug would be suitable for a specific towing job, nor does it necessarily reflect bollard pull of the tug. Towage consideration must be taken in relation to maneuvering characteristics of the tow and the prevailing weather, route, towing arrangements, wind surface freeboard area and speed of the tow. In this incident, a big floating crane of 140 m high was mounted on deck of the crane barge. This large deck structure could induce large wind resistance when under strong wind conditions. Besides the relative box shape hull would cause the crane barge to be susceptible to drifting by waves and current. When under poor weather conditions, there is a high possibility that the tugs might lose control of the barge.

[2] Richard A. Cady - Marine Hawser Towing Guide

5.3 Actions Taken by the Towing Convoy

Delay in notifying the VTIS and vessels in vicinity

5.3.1 Despite the fact that the towing convoy had lost control of the crane barge as early as 0400 on 7 December 2007, the Master in charge of the towing convoy did not inform the VTIS or other anchored vessels in the vicinity between 0400 to 0617. The first communication was only established at 0617 when the VTIS called the towing convoy via mobile phone.

5.3.2 Daesan VTIS observed the zigzag track of the towing convoy and called them for clarification on VHF Channel 16 at about 0523. There was no response from the towing convoy. At about 0614 when the towing convoy approached *"Hebei Spirit"* from a distance of 0.5 nautical mile, *"Hebei Spirit"* called via VHF Channel 16 and there was also no response from the towing convoy. The towing convoy appeared to have not maintained a proper VHF watch during this critical period thus unable to reply to these calls.

5.3.3 The first communication between Daesan VTIS and the Master of *"Samsumg No. 5"* was established only at about 0617 when VTIS called him via his mobile phone. After the conversation, at 0622 the VTIS notified *"Hebei Spirit"* to heave up anchor to avoid collision with the crane barge, by such time the crane barge was approaching at only 0.3 nautical mile from the bow of *"Hebei Spirit"*.

5.3.4 As early as 0400 on 7 December 2007 the towing convoy experienced difficulties in maintaining its control. Knowing the vulnerable conditions of the towing convoy, the Master should have immediately informed the VTIS the seriousness of the situation so that other vessels (not just *"Hebei Spirit"*) in the vicinity would be aware of its situation and take the necessary precautionary actions. He should also request assistance from the VTIS at the earliest opportunity.

5.3.5 The delaying in notifying the VTIS and other ships in the vicinity had caused insufficient preparation time for *"Hebei Spirit"* to take action to avoid a collision. At that time, *"Hebei Spirit"* had paid out 9 shackles (247 metres) of anchor chain into the water at its anchorage. For a vessel of about 270,000 deadweight it would take at least 30 to 40 minutes to prepare the engine and heave up the 9 shackles of cable from the water. Had the alert been given earlier, *"Hebei Spirit"* could have heaved up the anchor and avoid the collision.

Possible cause of wire parting

5.3.6 After the accident the main tow wire of tug *"Samsung T-5"* was found to be a used crane runner wire. This tow wire was put to use after it was replaced from the crane and left into a

store for some time. Crane wires tend to be of different construction when compare with a towing wire due to their different mode of operation. Use of improper tow wire could be dangerous because of possible shock loading and chafing of the wire while engaging in towing.

5.3.7 After passing the bow of *"Hebei Spirit"* the towing convoy increased the speed. However, in about 10 minutes' time after the increase, the towing wire parted. The Master in charge might have considered an attempt to increase the speed from avoiding further setting towards the *"Hebei Spirit"*. However, an increase of speed in rough sea condition might exert additional strain at the towing wire as a result of increase of force application. This would become critical if the towing wire was already pulled at its limit.

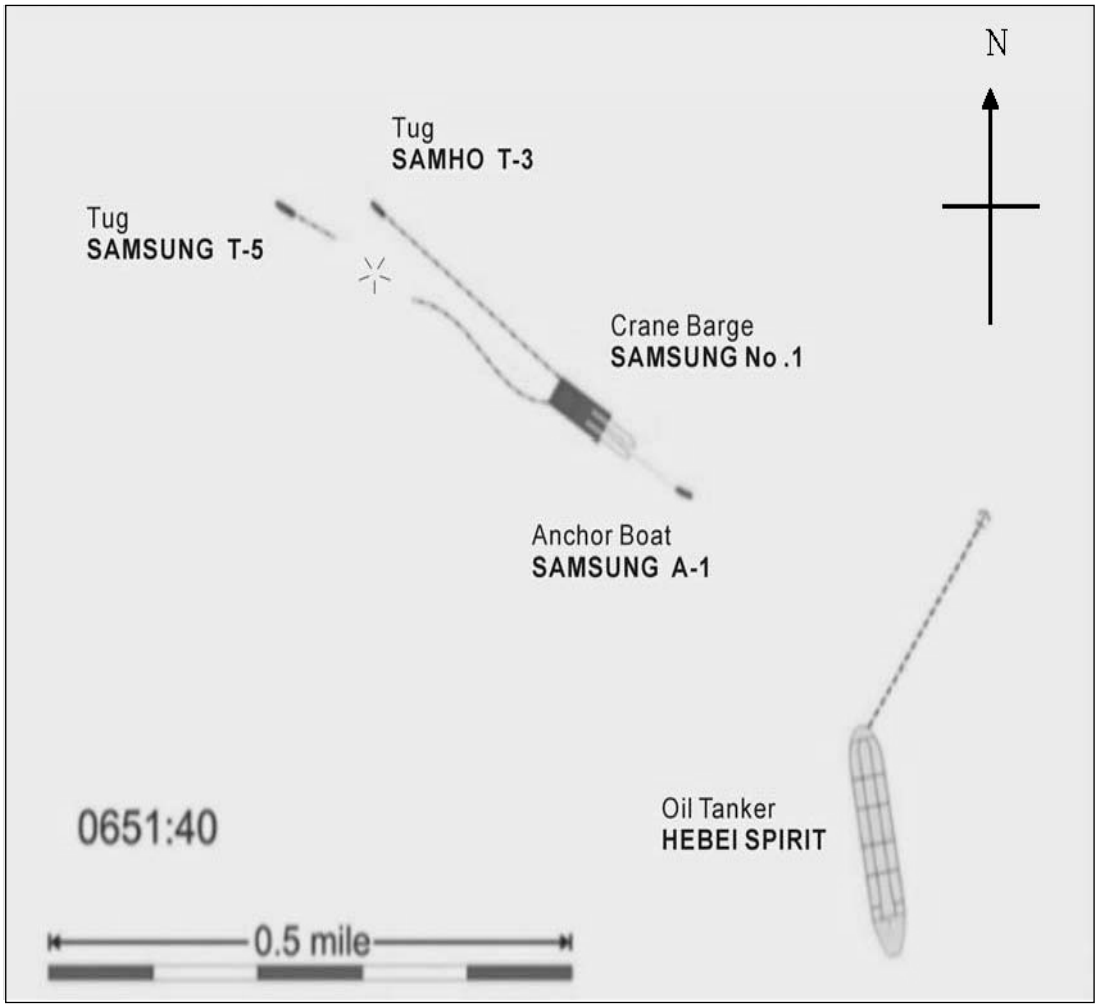


Fig. 8 Sketch of the approximate relative positions of *"Hebei Spirit"* and *"Samsung No. 1"*

5.4 Certification and Experience of Personnel - *"Hebei Spirit"*

5.4.1 The Master of *"Hebei Spirit"* is an Indian national. He is holding a Class 1 Deck Certificate of Competency issued by the United Kingdom Maritime and Coastguard Agency and a Class 1 Deck Officer Licence issued by the Marine Department of Hong Kong Special Administrative Region.

5.4.2 The Master was employed by the management company since 1991, initially as a Deck Cadet and promoted to Master in 2006 onwards. He joined the *"Hebei Spirit"* as Master on 12 October 2007. Since qualifying as a deck officer all of the ships that he had sailed on were oil tankers. He was properly qualified and experienced for the post on *"Hebei Spirit"* at the time of the accident.

5.5 Actions taken by *"Hebei Spirit"*

Decision not to Heave up Anchor

5.5.1 The VTIS advised *"Hebei Spirit"* to heave up anchor at 0622 when the crane barge was approaching to the bow. As the distance between the barge and *"Hebei Spirit"* was reducing, it would be dangerous if the vessel were to heave up its anchor at that moment. Heaving up the anchor would inevitably cause the vessel to move forward and increase the risk of collision.

5.5.2 The Master clarified the situation with the VTIS. Instead of heave up the anchor, he gave astern engine movement and slackened the anchor cable to increase the passing distance. As considerable time would be required to heave up the 9 shackles of anchor cable in water and the possible forward movement with the towing convoy just ahead in close proximity, action to heave up anchor would not be appropriate under the circumstances. It is considered that the Master had taken the right decision not to follow VTIS advice to heaving up anchor at the material time.

Remedial Actions after Collision

5.5.3 After the collision, *"Hebei Spirit"* attempted to reduce the scale of pollution by transferring oil from the damaged tanks and securing the collision mats at side of the damaged cargo oil tanks. As the VLCC was in a fully loaded condition and nearly all cargo oil tanks were at 98% capacity, the transfer of oil could only be done to the Nos. 3 and 5 cargo oil tanks, which were at 96.5% full. The transfer was taken in a cautious manner to avoid overflow that might aggravate the pollution situation. The Master also pumped ballast to starboard ballast tanks

with the intention to list the VLCC to starboard and lower the oil level in the damaged cargo tanks. These remedial actions appeared to have reduced certain amount of oil spillage.

5.5.4 The ship's Shipboard Oil Pollution Emergency Plan (SOPEP) was kept on board the *"Hebei Spirit"* and it provided instructions to the crew in case of emergency situations. Chapter 3 of the SOPEP described "Steps to Control Discharge". Paragraph 3.2 stated: "In responding to a casualty, the Master's priority will be to ensure the safety of personnel, the ship, cargo and the environment and to take action to prevent escalation of the incident".

5.5.5 Paragraph 3.2.5 "Hull Leakage" and paragraph 3.3.3 "Collision with Fixed or Moving Object" of the SOPEP mentioned the emergency duties and actions of the Master, Chief Officer and the Emergency Party in the form of check list. After assessing the remedial actions as described in paragraph 4.1.18 to 4.1.24 of this report, the actions taken by the Master and his crew of the*"Hebei Spirit"* after the collision are considered to have fully complied with the provisions as laid down in the SOPEP.

5.6 VTIS and the Anchor Position of VLCC

5.6.1 The anchored position at 36°52.3'N 126°03.1'E was advised by Daesan VTIS. In previous visits, *"Hebei Spirit"* was also instructed to anchor at similar position uneventfully.

5.6.2 To the north of this anchor position there are two traffic separation schemes (TSS) (37°15'N 126°15'E); one for inbound (Tong Sudo) and the other for the outbound traffic (Pando Sudo) of Inchon. To the south there is another TSS at west of Ong Do (36°40'N 126°00'E) guiding the north and southbound traffic. For traffic proceeds to Inchon from south the course adjoining the TSSs would cause the traffic to pass less than 1 nautical mile from the VLCC anchored position. For traffic from Inchon to south, the traffic would pass at about 2 nautical miles from the anchor position (fig. 9).

5.6.3 In this incident it is believed that the towing convoy might have originally planned to shape a south-westerly route of about 210 degree to join the TSS at west of Ong Do. With this course the towing convoy would have passed about 2 nautical miles from the anchored position of *"Hebei Spirit"*. However, due to the rough weather and loss of control, the towing convoy drifted towards the VLCC anchorage. As the anchored position was located between the routes of the passing traffic to and from the port of Inchon, it appears that the VLCC anchorage is too close to the passing traffic.

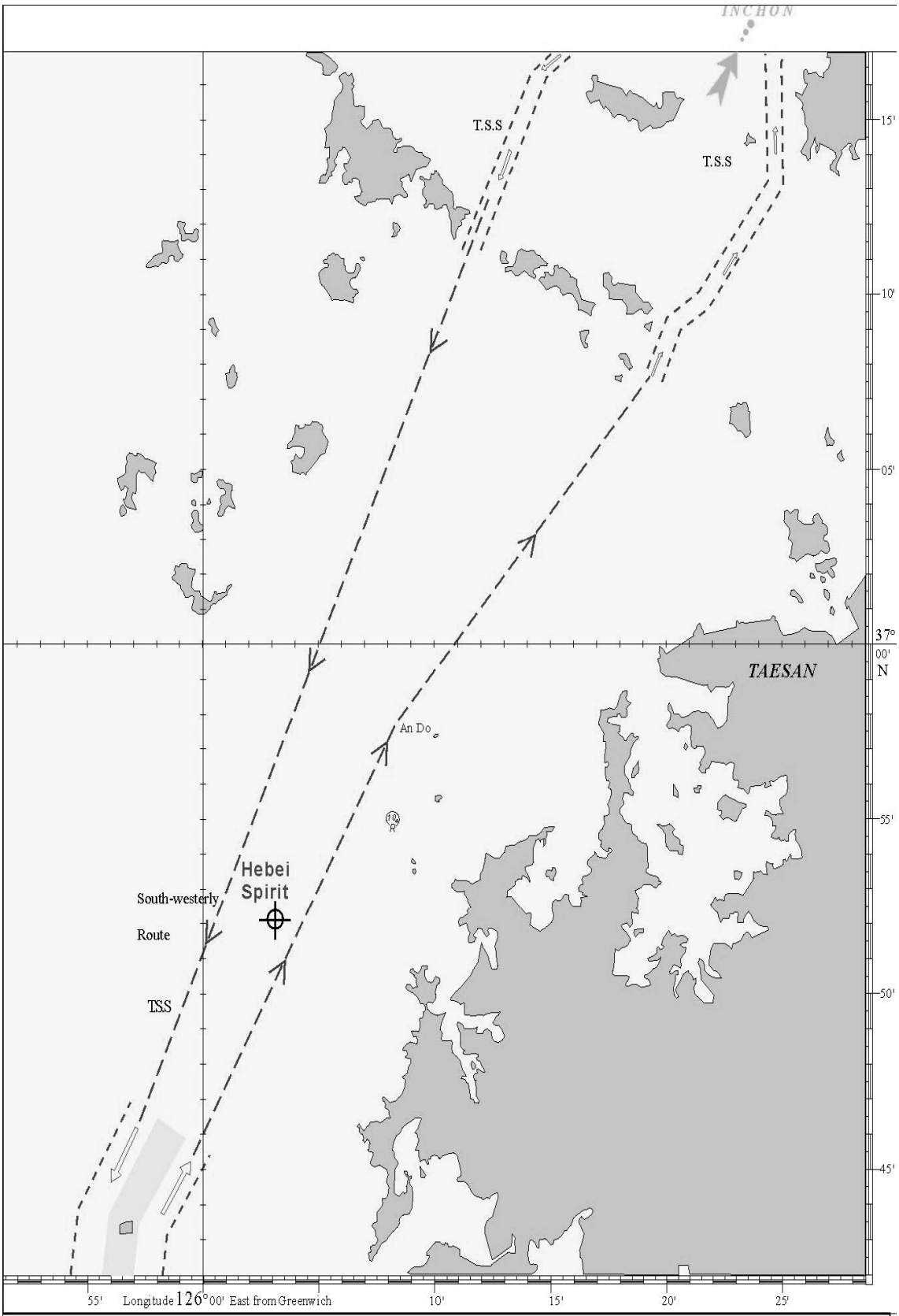


Fig. 9 Approaches to Inchon

6. Conclusions

6.1 On 7 December 2007 at about 0706, a collision incident occurred between a crane barge *"Samsung No 1"* and the Hong Kong registered vessel *"Hebei Spirit"* in the vicinity of Daesan, Korea in position 36◦52.3' N 126◦03.1' E. At time of the incident, the crane barge was towed stern first by the tugs *"Samho T-3"* and *"Samsung No 5"*. Weather conditions were reported as poor.

6.2 *"Hebei Spirit"* was carrying 263,541 tonnes of crude oil. It was anchoring off Daesan waiting for discharge at time of the incident. Shortly before the incident, the tug and tow crossed from starboard to port ahead of *"Hebei Spirit"*. After crossing, the towing wire parted and the crane barge drifted towards to *"Hebei Spirit"*. The crane barge made contact with the tanker in way of the port forward section. As a result of the contact, the port side of Nos. 1, 3 and 5 cargo tanks of *"Hebei Spirit"* were ruptured and caused severe oil pollution in sea area.

6.3 Anti-pollution measures were immediately taken on board *"Hebei Spirit"* to reduce the spillage. As an attempt to slow down the spill, the crew transferred cargo oil from the ruptured tanks into centre tanks and rigged collision mats to cover the ruptured areas. Oil boom was also rigged from the vessel trying to contain the oil. The estimated oil quantities spilled was about 10,900 tonnes.

6.4 The investigation revealed that the decision to commence the towing voyage when adverse weather had been forecast is the main contributory factor of this accident. The towing capability of the towing convoy during the voyage could not overcome the weather conditions. The delay in notifying the VTIS and other ships in the vicinity resulted insufficient time had been given for *"Hebei Spirit"* to take necessary actions to avoid the collision. The loss of control in the towing of crane barge caused direct contact with *"Hebei Spirit"*.

6.5 An increase in speed in rough sea condition generated additional strain which eventually broke the towing wire. It was known that an old crane runner wire was used as the towing wire at the time. The old crane runner wire, if not in good condition, might not be suitable for the purpose of towing and thus led to the accident.

6.6 The VTIS advised *"Hebei Spirit"* to heave up anchor at 0622 on 7 December 2007 when the crane barge was about 0.35 nautical mile from the bow. Given the close proximity of the crane barge, it is considered that the Master had taken the right decision not to heave up anchor at the material time.

6.7 After the collision, *"Hebei Spirit"* attempted to reduce the scale of pollution by transferring oil from the damaged tanks and securing the collision mats at side of the damaged cargo oil

tanks. Given the rough weather conditions, the transfer was taken in a cautious manner to avoid overflow that might aggravate the pollution situation.

6.8 The Master also pumped ballast to starboard ballast tanks with the intention to list the *"Hebei Spirit"* to starboard and lower the oil level in the damaged cargo tanks. These remedial actions appeared to have reduced certain amount of oil spillage. The actions taken by the Master and his crew after the collision are considered to have fully complied with the provisions as laid down in the ship's Shipboard Oil Pollution Emergency Plan.

7. Recommendations

7.1 Copies of report should be sent to the Master and management company of *"Hebei Spirit"*. The management company and the Master are to be assured of the proper actions that had been taken before and after the collision.

7.2 Two copies of report should be sent to the Korean Maritime Safety Tribunal and the Samsung Heavy Industries Co. Ltd. as the owner of the crane barge *"Samsung No. 1"* request them to consider the concerned issues in the investigation report.

8. Submissions

8.1 In the event that the conduct any person or organization is criticized in an accident investigation report, it is the policy of the Marine Department that a copy of the draft report is given to that person or organization so that they have an opportunity to rebut the criticism or offer evidence not previously available to the investigating officer.

8.2 Submission on the report was received from the management company of the *"Hebei Spirit"*, Korean Maritime Safety Tribunal and the Samsung Heavy Industries Co. Ltd. The Investigating Officer has taken into account some of the views from the submission and the draft report has been amended where appropriate. Other submissions that have not been incorporated into the report were responded separately to the parties concerned.

10 February 2009

Appendix 1

Chronological Sequence of Brief Events of the Accident

Time	*"Hebei Spirit"*	Towing Convoy	VTIS
6 December 2007			
1450		Towing convoy departed from Inchon for Geoje	
1718			VTIS informed *"Hebei Spirit"* of the assigned anchor position
1918	Let go anchor		
1924	Reported to VTIS of its anchored position		
2115	Master visited bridge last time before rest		
7 December 2007			
0200		Tug "Samsung T-5" received broadcast of adverse weather	
0400		Tugs had lost control over towing of crane barge	
0523			VTIS called the towing convoy on VHF Channel 16 but without response
0550		"Samho T-3" observed target of *"Hebei Spirit"* on radar	
0605	Chief Officer informed Master concerning passing of a tug and tow		
0606	Master arrived bridge		
0609	*"Hebei Spirit"* called VTIS regarding the passing crane barge		
0614	*"Hebei Spirit"* called the towing convoy on VHF Channel 16 but		

	without response		
0617	Chief Officer and AB at forecastle; Engine went dead slow astern		VTIS contacted Tug "Samsung T-5" via mobile phone – First communication established
0622			VTIS asked *"Hebei Spirit"* to heave anchor
0632		The crane barge passed ahead of *"Hebei Spirit"*	
0645.5 - 0654	Engine went dead slow astern		
0651		The towing wire of "Samsung T-5" parted	
0652			VTIS asked *"Hebei Spirit"* to heave anchor
0657	Engine went dead slow astern		
0658	Engine went slow astern Master told Chief Officer to slip anchor cable		
0658.5	Engine went half astern		
0706	Collision occurred		
0716			VTIS asked *"Hebei Spirit"* if they could extend the anchor chain
0719	*"Hebei Spirit"* requested VTIS to send few tugs for assistance		
0720	*"Hebei Spirit"* reported to VTIS that oil spills were observed		
0721	Engine went dead slow ahead and rudder hard to port to swing away from the barge		
0728	Reported the accident and pollution to VTIS		

0730	Master broadcast a radio navigational warning on VHF16		
0938	Korean Coast Guard onboard via helicopter		
0942	Collision mats were secured at the damaged areas		
1000	Started inert gas plant		
1115	Ran ballast into starboard ballast tanks; Oil leaked from No. 1 port cargo oil tank at about 250 barrels per hour		
2000	Oil spillage stopped		

（中華人民共和国香港特別行政区）

Report of Investigation into the Collision between Hong Kong registered cargo ship *Joshu Maru* and Republic of Korea fishing vessel *No.3Dae Kyung* in position about 72 miles southeast of Jeju-Do, the Republic of Korea on 14 November 2009

The Hong Kong Special Administrative Region
Marine Department
Marine Accident Investigation Section

Purpose of Investigation

This incident is investigated and published in accordance with the Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code) adopted by IMO Resolution MSC 255(84).

The purpose of this investigation conducted by the Marine Accident Investigation and Shipping Security Policy Branch (MAISSPB) of Marine Department is to determine the circumstances and the causes of the incident with the aim of improving the safety of life at sea and avoiding similar incident in future.

The conclusions drawn in this report aim to identify the different factors contributing to the incident. They are not intended to apportion blame or liability towards any particular organization or individual except so far as necessary to achieve the said purpose.

The MAISSPB has no involvement in any prosecution or disciplinary action that may be taken by the Marine Department resulting from this incident.

Table of Contents

1. Summary

1.1 At about 2147 local time on 14 November 2009, the Hong Kong registered general cargo ship *Joshu Maru* collided with the Republic of Korea fishing vessel *No.3 Dae Kyung* in approximate position 32°13.7' N 127°21.3' E, about 72 nm (nautical miles) southeast of Seogwipo, Jeju-Do(Cheju-Do), the Republic of Korea.

1.2 At the time of the collision, the weather was cloudy, the visibility was about 3 to 6 nm, the wind was northwest to west force about 7 to 6 and the sea state was rough with heavy swells.

1.3 Following the collision, *No.3 Dae Kyung* took in water, became semi-submerged and finally foundered on the next day. Seven out of the total nine crewmembers onboard were lost (four dead and three missing). The remaining two were rescued by the crew of *Joshu Maru* and afterwards conveyed by Korea Coast Guard to hospital for treatment in Seogwipo. On the other hand *Joshu Maru* incurred some scratches to paintwork and slight indentation in the ship's stem and at the port bow.

1.4 The investigation revealed the following contributory factors:

(i) The Third Officer of *Joshu Maru* did not comply with Rule 7, Rule 8 and Rule 15 of COLREGS[1]. Based on scanty radar information, he first took actions by making a succession of small alterations of course to port just to keep own ship further away from *No.3 Dae Kyung* when he saw the light (the masthead light) of *No.3 Dae Kyung* at about 20°on own ship's starboard bow at ranges of 6 and 3 nm respectively. He did not call the Master even though the movement of *No.3 Dae Kyung* was causing concern afterwards. He continued altering course slowly then hard to port instead of taking action to avoid crossing ahead of *No.3 Dae Kyung* when he saw the red light (the port sidelight) of *No.3 Dae Kyung* at about 20°and 10°on own ship's starboard bow (crossing situation) at ranges of 1.5 and 0.5 nm respectively until collision occurred; and

(ii) The bridge team of *No.3 Dae Kyung* did not comply with Rule 5 of COLREGS. They did not maintain a proper and effective lookout and, consequently, not aware of the presence of *Joshu Maru* until the moment collision occurred.

[1] COLREGS -International Regulations for Preventing Collisions at Sea, 1972, as amended.

2. Description of the vessels

2.1 **Joshu Maru**(常秀丸)

.1 Ship Information

Flag	:	Hong Kong, China
Port of Registry	:	Hong Kong
IMO No.	:	7727762
Call Sign	:	VRBE4
Type	:	General Cargo Ship (Deck Cargo Carrier)
Year of Built	:	1977
Gross Tonnage	:	3,843
Length (Overall)	:	110.95 m
Main Engine	:	2 x MITSUBISHI 8UET 45/80D
Engine Output (M.C.O.)	:	4,266 kw (5,800 ps) x 230 RPM
Service speed	:	11.8 knots
Classification Society	:	Bureau Veritas
Shipbuilde	:	Mitsubishi Heavy Industries Ltd. (Japan)
Registered Owner	:	Kambara Kisen (Hong Kong) Limited
Management Company	:	CPN Frontier (Shanghai) Co., Ltd.
Operator	:	Kambara Kisen Co. Ltd. (Japan)
Persons onboard	:	18

.2 *Joshu Maru* was a Hong Kong registered general cargo ship classed with Bureau Veritas. She was converted for the carriage of large fabricated ship components, such as accommodation and ship's block, for shipbuilding yards in Japan e.g. Fukuyama, Shimonoseki, etc. and in China e.g. Zhoushan.

.3 She had only one cargo hold which was located forward between the forecastle and the forward ship's bridge structure. The ship's funnel structure was in the middle between the ship's bridge structure and the after end of the ship. Large deck cargoes, such as prefabrication of accommodation and ship's block, were loaded on the supporting structure on the "strength deck" in between the ship's bridge structure and the funnel structure, and also that aft of the funnel structure. There were several decks on *Joshu Maru*. They were the "Navigating Bridge Deck", the "Upper Bridge Deck", the "Lower Bridge Deck", the "strength deck", the "upper deck" and the "2nd deck" respectively. The crew accommodation and cabins including the Master's cabin were located on the "upper deck".

.4 The navigational equipment on board consisted of one set each of standard magnetic compass, gyro compass, nautical charts and nautical publications, Global Positioning System (GPS), Automatic Identification System (AIS), shipborne Long Range Identification Tracking equipment (LRIT), Voyage Data Recorder (VDR), speed log, echo sounder, operational mode indicator (rudder, propeller, thrust and pitch) and daylight signaling lamp as well as two sets each of Very High Frequency (VHF) and radars (one X-band and one S-band radar, each fitted with automatic radar plotting aid (ARPA) facility).

.5 *Joshu Maru* was equipped with a bridge control system, two main engines with two sets of controllable pitch propellers (CPP) and a bow thruster.

.6 She was manned by a Master, 3 deck officers, 4 engineers and 10 ratings. The nationality of all crewmembers was Chinese.

Figure. 1 -Joshu Maru (常秀丸)

2.2 *No. 3 Dae Kyung*

.1 Ship Information

Flag	:	Korea, Republic of
Port of Registry	:	Yeosu, Jenam
Type	:	Fishing vessel
Year of Built	:	1998
Gross Tonnage	:	29
Length	:	26.20 m
Breadth	:	4.87 m
Engine	:	Diesel engine
Engine Power	:	441 kW x 1
Owner	:	Individual (O Seok Hwan)
Persons onboard	:	9

.2 *No.3 Dae Kyung* was a Republic of Korea fishing vessel made of fiberglass reinforced plastic. The vessel was equipped with navigational equipment consisting of one set each of magnetic compass, X-band radar (Furuno FR7062-12A) and VHF (Very High Frequency) as well as two sets of GPSs (Samyoung Navis 3700).

.3 The vessel was manned by a crew consisting of 9 members including one Republic of Korea Master, six Republic of Korea crewmembers/fishermen and two Indonesian crewmembers/fishermen.

Figure. 2 -*No.3 Dae Kyung* semi-submerged in water after collision

3. Sources of Information

3.1 *Joshu Maru*'s Master, watch-keeping officers and ratings, and ship management company.

3.2 *No.3 Dae Kyung*'s Master and Cook, i.e. the survivors.

3.3 Korea (Mokpo) Maritime Safety Tribunal, the Republic of Korea.

3.4 Korea (Seogwipo) Coast Guard, the Republic of Korea.

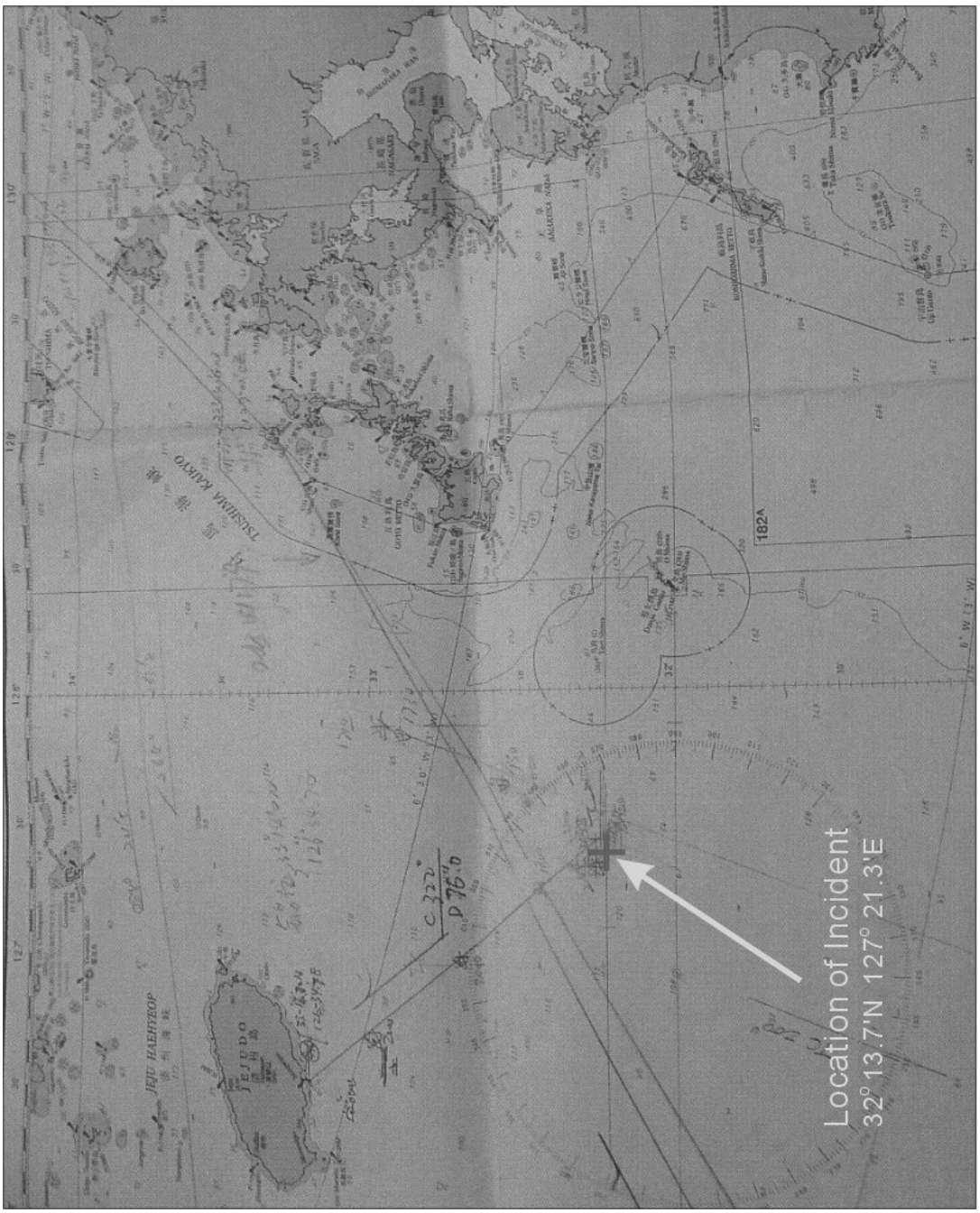


Figure. 3 - Chartlet showing the location of incident.

4. Outline of Events

All times are local (UTC+9)

4.1 Account of *Joshu Maru*

.1 At 1200 on 13 November 2009, the Hong Kong registered cargo ship *Joshu Maru* departed from Fukuyama, Japan, to Zhoushan, China. The vessel carried an unit of auxiliary boiler and some packaged spare parts which were stowed in the cargo hold forward of the bridge structure. The drafts at the time of departure were 3.7 metres forward and 4.8 metres aft respectively.

.2 After transiting the Inland Sea and passing the Kanmon Bridge of Japan, the vessel arrived in the GPS position 33°24.0' N, 129°00.0' E at 1050 on 14 November 2009. After that the vessel followed a south-westerly course of 237°T for the destination, Zhoushan, as per the voyage plan.

.3 The weather was cloudy and the sea state was rough with heavy swells before the collision. The wind slackened from a northwesterly direction of force about 8 to 7 to a westerly direction of force about 7 to 6. The visibility was about 6 nm.

.4 At 2000 on 14 November 2009, the OOW (Officer of the Watch) i.e. the Third Officer and the duty AB (Able-bodied Seaman) were keeping navigational watch on the bridge. Navigation lights were on since sunset. The steering was kept on auto-pilot mode. The ship's course was adjusted to and set on 220°T since the last watch due to prevailing adverse weather condition. The ship's speed was at about11.5 knots. Two radars, one X-band and one S-band, were operational and set on 6 and 12 nm range scale respectively. Both radars were kept on relative motion with relative vector display and in head up presentation.

.5 At about 2125, the OOW visually observed two separate dim yellowish lights on the starboard side of the ship. The closer one was at about 20°on own ship's starboard bow. He acquired the closer target (known to be *No.3 Dae Kyung* after the collision) on the X-band radar. On the radar screen he observed that the target was about 6 nm ahead moving at a speed of about 6 knots in an approximate opposite direction. Considering that the prevailing strong wind and heavy swells from the starboard side would set the fishing vessels (the two separate dim yellowish lights) towards own ship if own ship continued on the same course and speed, the OOW altered course to port by 10°from 220°T to 210°T, by means of the "auto-pilot" control, to keep own ship further away from the fishing vessels.

.6 The OOW observed that the tracked target (*No.3 Dae Kyung*) was lost and disappeared from the radar screen occasionally. He re-acquired the target accordingly.

.7 At about 2135, the OOW observed that the target was getting closer. The target was almost on the same visual bearing i.e. 20°on own ship's starboard bow but at a closer range of about 3 nm, he asked the AB to change to hand-steering mode and alter course slowly to port from 210°T to 190°T. At the same time he indicated his intention by signaling the target with 2 flashes on the Aldis lamp. One reason for his continuous alteration of course to port was that he considered that the strong wind from the ship's starboard side and the rough sea would affect the rudder response if the helm was made to alter course to starboard. The other reason was to keep own ship further away from the target.

.8 At about 2142, the OOW saw the red light (the port sidelight) of the target. The light was at about the same 20°on own ship's starboard bow with estimated distance off about 1.5 nm or less. The OOW ordered the AB to keep altering course slowly to port and to be steady on 190°T. He also indicated his intention by signaling the target with 2 flashes on the Aldis lamp and afterwards warned the target repeatedly with more than 5 flashes. However, the target showed no response and appeared to be moving and approaching own ship with the same course and speed.

.9 At about 2144, the OOW visually observed that the target showing the red light was at about 10°on own ship's starboard bow with an estimated distance of less than 0.5 nm away, he instructed the AB to put the helm hard to port. At the same time he made continuous flashings on the Aldis Lamp to warn the target.

.10 Just before the collision, the OOW stopped the ship's engines by pulling back the telegraph lever to "stop" position. At about 2145, he felt that own ship had collided with the target, i.e. the fishing vessel. He could not clearly see the point of contact as the fishing vessel was approaching and passing under own ship's bow while own ship was turning hard to port. He estimated that the angle of contact between own ship and the fishing vessel (*No.3 Dae Kyung*) was about 70°when collision occurred.

.11 Immediately after the collision, the OOW sounded the general alarm and asked the AB to telephone the Master. When the Master arrived on the bridge in about 20 to 30 seconds, the OOW informed him that own ship had collided with a fishing vessel. The Master then ordered the AB to switch on all deck lights, and ran to the port bridge wing where he saw and heard two persons in water yelling for help.

.12 Afterwards the Master returned to the wheelhouse and took command. When the Chief Officer and the Second Officer arrived on the bridge, the Master tasked them to take charge of the rescue operation and to send distress messages as well as plot the ship's positions respectively.

.13 The Master made several manoeuvres to approach the two persons in water. By 2310, the two persons (later identified to be the Master and the cook of *No.3 Dae Kyung)* were rescued by the crew of *Joshu Maru*. After that *Joshu Maru* continued with the Search and Rescue (SAR) operation throughout the night searching for the rest of the crew of the fishing vessel. Later, helicopters and ships from Japan and Korea Coast Guard arrived on scene and joined in the SAR operation. The operation lasted until afternoon 15 November 2009.

4.2 Account of *No. 3 Dae Kyung*

.1 At 1000 on 6 November 2009, the Republic of Korea registered fishing vessel *No.3 Dae Kyung* departed from Sungsanpo, Jeju-Do, for deep sea fishing. On 12 November 2009, the vessel arrived in the position 30°17.0' N 125° 07.0' E. The vessel then followed a north-easterly course with a speed of about 6 knots for the destination, 34°17.0' N 129°45.0' E, a position east of the Tsushima Island (Japan) in the Tsushima Strait (Korea Strait Eastern Channel).

.2 On 14 November 2009, the weather was bad in the morning, the wind was strong and the wave height was about 3 to 4 metres. In the afternoon, after about 1800, the weather became better. The wind slackened to north-west with speed about 10 to 12 metre per second i.e. about force 5 to 6 and the wave height reduced to about 2.5 metres. The visibility was about 3 nm or more.

.3 Before the collision, there were 3 crewmembers on the bridge, namely, the Korean Master, the Korean helmsman and the Indonesian watch assistant. The Master, who was the overall in charge of *No.3 Dae Kyung* and responsible for monitoring the radar, was taking rest in the after part of the wheelhouse. The helmsman was on hand-steering, keeping the ship's course as well as performing look-out duty. The watch assistant assisted the helmsman in keeping look-out duty. Only the normal navigation lights were switched on after sunset since no fishing operation was being carried out due to the prevailing adverse weather condition. The X-band radar was switched on for watch-keeping purpose, and two GPS devices were used for monitoring the ship's position.

.4 The Master of *No.3 Dae Kyung* remembered that, just before the collision, the helmsman and the watch assistant were on hand-steering and keeping look-out duty respectively. Nothing abnormal was perceived by and reported to him. No targets or ships were observed visually or detected on the radar before the collision. *No.3 Dae Kyung* continued on her course and proceeded at a speed of about 6 knots for her destination.

.5 Only when the Master felt that own ship was suddenly struck heavily at the ship's port quarter between the engine compartment and the stern, he realized that own ship had

collided with another ship. Consequent to the collision, *No.3 Dae Kyung* was damaged and took in water. The vessel sank and became semi-submerged but still afloat in water. Shortly afterwards, the Master managed to escape from the ship. When he surfaced with his head out of the water yelling for help, he saw a big ship with white lights moving away from him.

.6 At the time of the collision, the cook was in the forward part of *No.3 Dae Kyung* and inside the vessel's temporary lavatory. Immediately after the collision, seawater flushed over *No.3 Dae Kyung* and he was washed to the sea.

.7 After several attempts by *Joshu Maru*, the Master and the cook of *No.3 Dae Kyung* were rescued by the crew of *Joshu Maru.* Later, they were conveyed by the Korea Coast Guard to hospital for treatment in Seogwipo, Jeju-Do.

5. Analysis

All times are local (UTC+9)

5.1 Certification and Experience of Personnel

.1 The Master of *Joshu Maru* held a valid Master Certificate of Competency issued by the People's Republic of China and a Class 1 Licence (Deck Officer) issued by the Marine Department of the Government of Hong Kong Special Administrative Region. He had about 21 years of seafaring experience and had been serving as master for about 9 years.

.2 The OOW, the Third Officer, of *Joshu Maru* held a valid Third Mate Certificate of Competency issued by the People's Republic of China and a Class 3 Licence (Deck Officer) issued by the Marine Department of the Government of Hong Kong Special Administrative Region. He also held a certificate for Radar Observation and Plotting and Radar Simulator, and a certificate for ARPA Simulator issued by the People's Republic of China on 13 July 2006. After graduation from the nautical institute in 2007, he gained about 21 months of total seafaring experience. He had served as deck cadet for 4 months, AB for 5 months, assistant watch-keeping officer for 5 months, and Third Officer for about 7 months. He just started keeping the "8 to 12" watch independently as the OOW when he joined *Joshu Maru* in April 2009.

.3 The duty AB of *Joshu Maru* held a valid navigational watch-keeping certificate issued by the People's Republic of China. He had about 5 years of seafaring experience and had served as deck trainee, ordinary seaman, carpenter and watch-keeping AB. He had been keeping the "8 to 12" watch on board *Joshu Maru* since July 2009.

.4 The Master of *No.3 Dae Kyung* held a valid Master Certificate for fishing vessel issued by the Republic of Korea. He had been working on fishing vessels for about 18 years and had about 9 years of experience as a master on fishing vessel.

.5 It is considered that the operating personnel of *Joshu Maru* are properly certificated with appropriate experience. However, it is observed that it was the first time and the first ship for the Third Officer to start keeping independent navigation watch as the OOW when he joined *Joshu Maru* in April 2009. Before that, he had only 10 months of watch-keeping experience, 5 months as watch-keeping rating/AB and 5 months as assistant watch-keeping officer on board a ship under a different management company. In this regards, he might need some guidance or supervision by the Master or other senior officers onboard in aspect of keeping navigation watch.

.6 The Investigating Officer of the Mokpo Maritime Safety Tribunal confirmed that the *No.3 Dae Kyung* is properly manned with certificated and experienced crew.

5.2 Certification of the vessels

.1 All statutory certificates of *Joshu Maru* issued by Bureau Veritas on behalf of the Marine Department of Hong Kong Special Administrative Region were valid.

.2 There was no evidence to indicate that the engines and/or equipment onboard *Joshu Maru* had failed prior to and after the accident.

.3 The Investigating Officer of the Mokpo Maritime Safety Tribunal confirmed that all the ship's certificates of *No.3 Dae Kyung* were valid.

5.3 Weather and Visibility

.1 According to the Master of both vessels and the OOW of *Joshu Maru*, at the time of the collision, the weather was cloudy. The visibility was about 3 to 6 nm. The wind was northwest to west force about 7 to 6. The sea state was rough with heavy swells.

.2 The prevailing strong wind and the heavy seas and swells before and at the time of the collision might affect the performance of the two vessels in keeping the ships' course and speed and in manoeuvring the vessels. The visibility is considered not posing any problem in look-out duty.

5.4 Actions taken by *Joshu Maru*

.1 According to the statements of the OOW, i.e. the Third Officer, of *Joshu Maru*, at about 2125 on 14 November 2009, when he saw the dim yellowish light of the target (*No.3 Dae Kyung*) at about 20°on own ship's starboard bow, he acquired the target on the X-band radar. He observed that the target was about 6 nm away moving at a speed of about 6 knots in an approximate opposite direction. Having considered that the target would be set towards own ship by the prevailing strong wind and heavy swells from the starboard side if own ship continued on the same course and speed, the OOW made an alteration of course by 10°to port from 220°T to 210°T just to keep own ship further away from the target. After 10 minutes at about 2135, he observed that the light of the same target was almost on the same visual bearing, i.e. about 20°on own ship's starboard bow but at a closer range of about 3 nm. He asked the AB to alter course slowly to port from 210°T to 190°T with the intention to keep own ship further away from the target.

.2 Prior to the actions taken at about 2125 and 2135, the OOW did not obtain full radar and ARPA information of the target. He only obtained and taken into account of the range and the speed of the target, but not the CPA (Closest Point of Approach) and the TCPA (Time of Closest Point of Approach). He did not make full use of the available radar and ARPA information, such as the CPA and the TCPA, to properly assess and determine if risk of collision existed before he took avoiding actions. He had not made a full appraisal of the situation and not correctly identified the conflicting situation between own ship and the target as to whether it was a head-on or a crossing situation. Instead, based on scanty radar information and assumption that the target would be set towards own ship by the prevailing strong wind and heavy swells, he took avoiding actions by making a succession of small alterations i.e. 10°of course to port just to keep own ship further away from the target. Despite the actions taken at about 2125 and 2135 respectively, the target was observed remaining on almost the same visual bearing on own ship's starboard bow but at a closer range. This indicated that risk of collision still existed. However the OOW was not aware that the avoiding actions taken were either ineffective or might be inappropirate. He failed to comply with Rule 7 and Rule 8 of COLREGS.

.3 When the OOW observed that the target was lost and disappeared from the radar (X-band) screen occasionally, he re-acquired the target accordingly. To keep monitoring the movement of the target that lost occasionally, he should also use the demographic pencil to mark the position and the track of the target on the radar screen in addition to the use of electronic bearing line and marker and ARPA. He should also acquired the target by the S-band radar which would allow him to obtain a more stable tracking of the target, particularly, in heavy seas and swells condition.

.4 At about 2142, the OOW saw the red light (the port sidelight) of the target. The light was on almost the same visual bearing i.e. 20°on own ship's starboard bow but at an estimated shortening distance of less than 1.5 nm, he ordered the AB to keep altering course slowly to port and to be steady on 190°T. He indicated his intention by signaling the target with 2 flashes on the Aldis lamp and afterwards warned the target with more than 5 flashes. However, the target showed no response to the warning flashes. At this stage, the movement of the target was causing concern but the OOW did not call the Master.

.5 When the OOW visually observed that the red sidelight of the target was on own ship's starboard bow, he should have realized that the conflicting situation was a crossing situation and that the target was crossing from own ship's starboard side to the port side. According to COLREGS, in this situation *Joshu Maru* was the give-way vessel and should keep out of the way and avoid crossing ahead of the target, *No.3 Dae Kyung*. To avoid crossing ahead of the target, *Joshu Maru* could make a broad alteration of course to starboard to pass port to port with the target or slacken the ship's speed or, if necessary, stop the vessel to let the target pass ahead. Since the OOW considered it difficult to make a broad alteration of course to starboard due to the strong prevailing wind and heavy swells from the starboard side and their effects on the response of the rudder, he did not alter course to starboard. However, he did not consider slacken the ship's speed either. Instead, he ordered the AB to keep the vessel turning slowly to port and to be steady on 190°T. He failed to comply with Rule 15 of COLREGS.

.6 At about 2144, the OOW visually observed that the target showing the red light was at about 10°on own ship's starboard bow with an estimated distance of less than 0.5 nm, he instructed the AB to put the helm hard to port trying to keep own ship away from the target. At this critical moment, the crossing target was only less than 0.5 nm away, it would not be sufficient to avoid crossing ahead of the target by just keeping own ship turning hard to port. The OOW should consider drastically slacken own ship's speed or even take all way off by stopping or reversing her means of propulsion.

.7 With reference to *Joshu Maru*'s manoeuvring characteristics (Figure. 4), the stopping distance was 0.2 miles (nautical miles) under both normal loaded and ballast conditions using engines emergency astern and with minimum application of rudder. Should the OOW drastically slacken own ship's speed or even take all way off, the CPA of the target would be increased and the target might be able to pass clear ahead or, if not, the impact on collision would be reduced and the consequences would be less serious. However, he did not stop the ship in ample time. Instead, he instructed the AB to keep the vessel turning hard to port and stopped the ship's engine just before the collision. He failed to comply with Rule 8 of COLREGS.

.8 *Joshu Maru* was equipped with two main engines and two sets of controllable pitch propellers. With this type of propulsion system, it allowed the ship's speed and the direction of propulsion to be changed in a non-stop manner by controlling the propeller pitch. To stop the ship with this type of system, the operator needed only to shift from a forward propeller pitch to a reverse one or vice versa even without changing revolutions. The propeller pitch could be appropriately adjusted or controlled for the required ahead or astern propulsion in ship handling via the bridge mounted engine and propeller control system in the wheelhouse.

.9 When the range of the target was less than 0.5 nm from own ship and shortening, the OOW warned the target just by continuous flashings on the Aldis lamp. This action might not be effective enough. He should also warned the target (*No.3 Dae Kyung*) by making the appropriate sound signals on the whistle in addition to the continuous warning flashes. Should he have sounded the appropriate warning signals on the whistle, the target might have been warned and might be able to response and take action as would best aid to avoid collision.

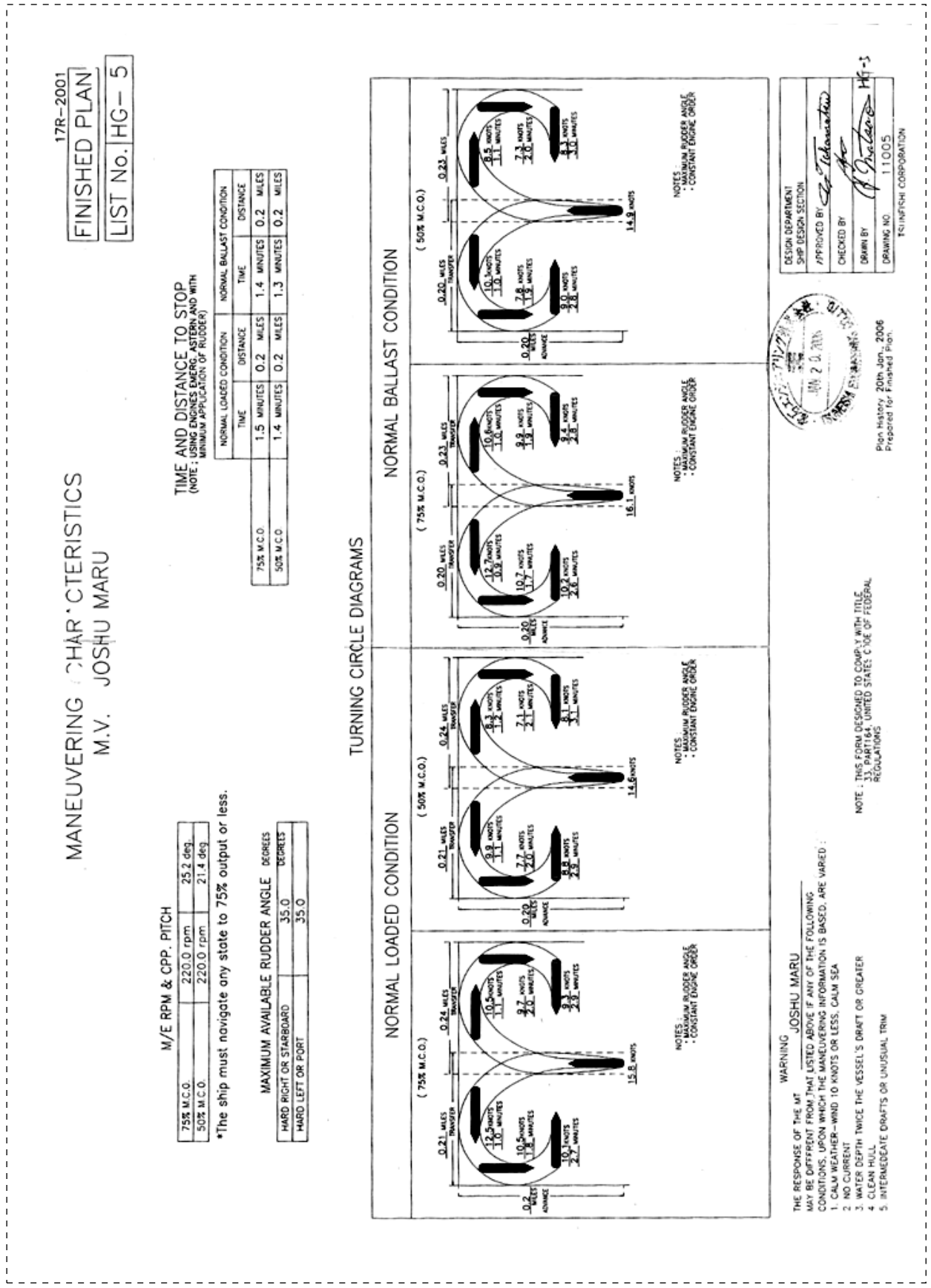


Figure. 4 —The Manoevuring Characteristics of Joshu Maru

5.5 Actions taken by *No.3 Dae Kyung*

.1 According to the statements of the Master of *No.3 Dae Kyung*, before the collision, *No.3 Dae Kyung* was proceeding along a north-easterly course for her destination to the east of the Tsushima Island at a speed of about 6 knots. One set of radar and two sets of GPS were used for navigational watch-keeping purpose. The helmsman and the watch assistant were in the wheelhouse and on hand-steering and look-out duty respectively. The Master, who was the overall in charge of the vessel and responsible for monitoring the radar, was taking rest in the after part of the wheelhouse.

.2 The Master remembered that before and up to the time of the collision nothing abnormal was perceived. No targets or ships were observed visually or detected on the radar. *No.3 Dae Kyung* continued on her course and speed for the destination. The bridge team, consisting of the helmsman, the watch assistant and the Master, did not detect the presence and the approaching of *Joshu Maru* despite that the radar was used and monitored for target detection and that both the helmsman and the watch assistant were on visual look-out duty. It is considered that the bridge team of *No.3 Dae Kyung* had not maintained a proper and effective look-out and failed to comply with Rule 5 of COLREGS.

5.6 Calling the Master

.1 Chapter VIII of the STCW Code stipulates standards in performing navigational watch. The officer in charge of the navigational watch shall notify the master immediately if the traffic conditions or the movements of other ships are causing concern or when in doubt as to what action to take in the interest of safety. Additional assistance on the bridge is important to safe navigation under these circumstances. In this incident, when the movement of *No.3 Dae Kyung* was causing concern where the visual or compass bearing of *No.3 Dae Kyung* remained almost the same but the range was shortening from 6 to 1.5 nm despite alterations of course to keep own ship away from *No.3 Dae Kyung* were made, the OOW of *Joshu Maru* did not notify the Master. Instead, he continued taking avoiding actions on his own judgment until the collision occurred. Before and at the time of the collision, the Master was not on the bridge and was not informed of the situation.

.2 Failing to inform the Master, the OOW would not be able to benefit from the Master's knowledge, experience and judgment. Assistance would have certainly been rendered by the Master should he be called in ample time.

.3 In addition, the ship was so designed that the Master's cabin was located on the upper deck that was four decks below the navigating bridge. In this incident, it took the Master about 20 to 30 seconds to climb upstairs passing the unsheltered "Strength Deck", the "Lower Bridge

Deck" and the "Upper Bridge Deck" to reach the bridge. Hence the OOW should be made aware that it took times, about 20 to 30 seconds, for the Master to reach the bridge should the Master be called for assistance.

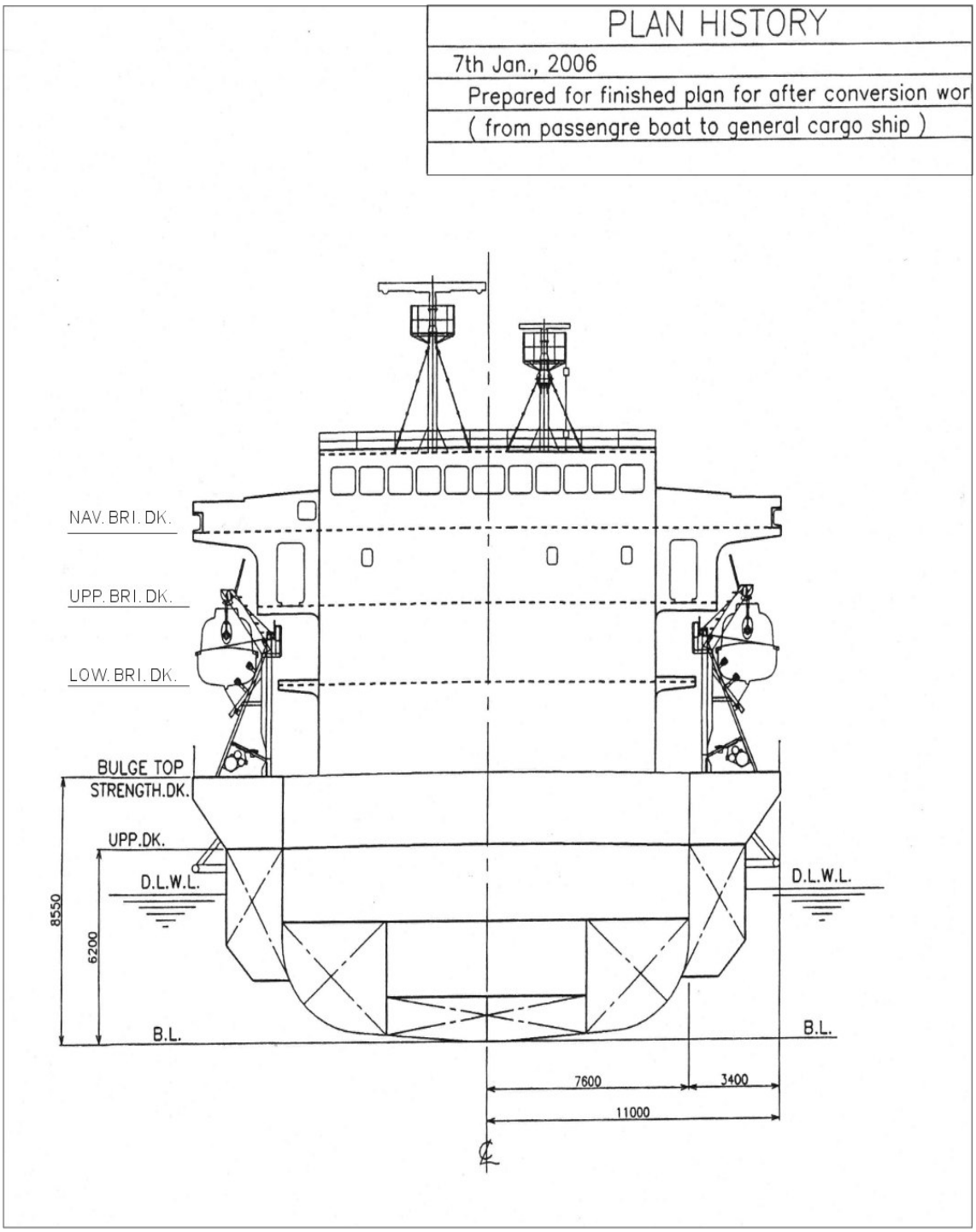


Figure. 5 – Front view of *Joshu Maru* showing the various decks to the Navigating Bridge.

5.7 Fatigue and alcohol impairment

.1 There was no evidence to suggest that alcohol or drugs were taken by any of the crewmembers involved in the collision.

.2 The OOW and duty AB onboard *Joshu Maru* declared that they had sufficient rest prior to reporting duty at 1945 on 14 November 2009 while the Master of *No.3 Dae Kyung* confirmed that he, the helmsman and the watch assistant had sufficient rest prior to taking watch duty before the collision. Fatigue was not an issue in this incident.

5.8 VDR data of *Joshu Maru*

.1 After the collision at about 2147 on 14 November 2009, the VDR data of *Joshu Maru* was not back-up until 2 days later, i.e. on 16 November 2009. It had exceeded the twelve-hour recording capacity for the preservation of the VDR data. Hence the VDR data covering the course of the incident were over-written and could not be retrieved for investigation analysis.

.2 In the ship's documents or manuals, procedure for shipboard personnel to make proper back-up or preservation of the VDR data after significant event such as collision was not found.

5.9 The Time and the Position of the Collision

.1 It was found that the times relating to the incident such as the times of alterations of course and the time of the collision recorded by *Joshu Maru* were having several minutes difference from that listed in the AIS information as recorded by the Korea Vessel Management System. The time of the collision, 2147 local time, as evidenced by the eminent reduction in ship's speed and changes in ship's course and heading shown in the AIS information was considered appropriate and adopted for investigation purpose.

.2 The position 32°13.7' N 127°21.3' E corresponding to the time 2147 listed in the AIS information was considered to be appropriate and taken as the collision position.

5.10 The track of the vessels

.1 According to the AIS information, the track of *Joshu Maru* before and minutes after the collision is plotted and shown in Figure 6 and Figure 7.

.2 However there is not sufficient information regarding the positions and the track of the involved fishing vessel *No.3 Dae Kyung*. No relevant AIS and VDR information are available

since the vessel is not required to install the shipboard AIS and VDR equipment and also the shore-based radar for tracking and monitoring of vessel traffic is out of coverage. The only relevant information that could be referred to is from recalling the memory of the OOW of *Joshu Maru*. The OOW could only remember in approximation the times, the relative bearings and the distances in relation to the positions of *No.3 Dae Kyung*. It is considered not reliable to construct a track for *No.3 Dae Kyung* solely from this available approximate information.

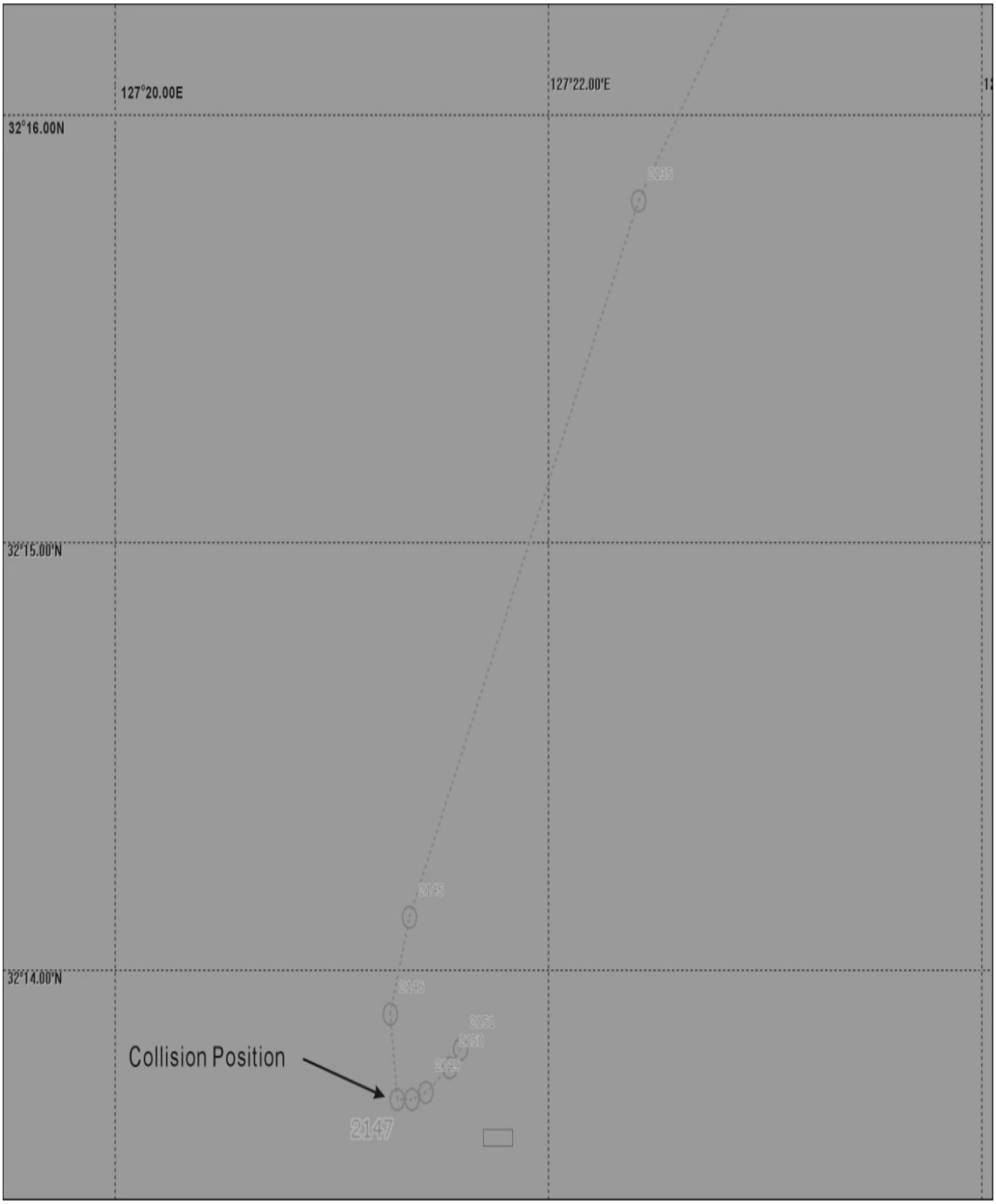


Figure. 6 – Chartlet showing the track of *Joshu Maru* before and after the collision.

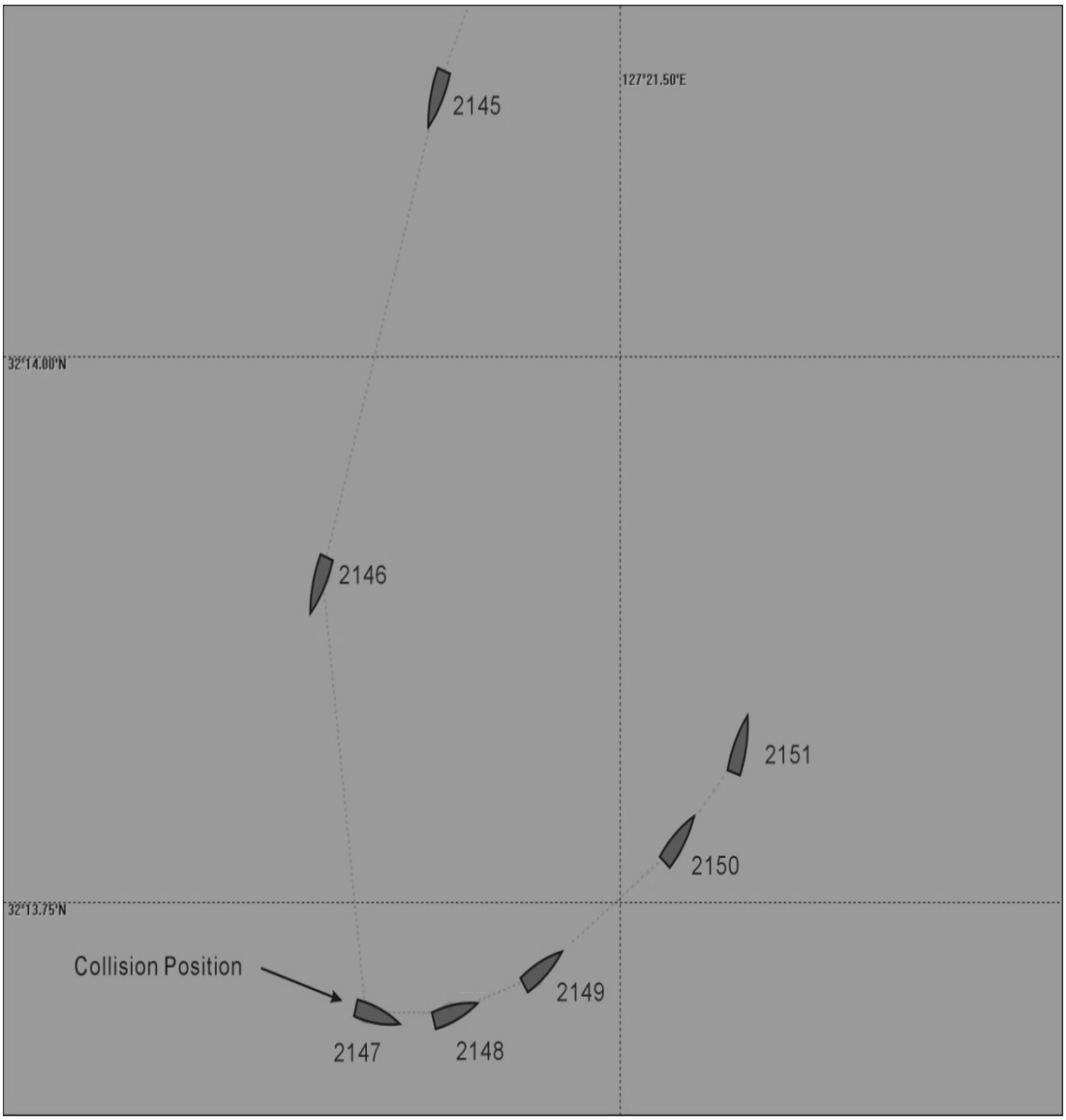


Figure. 7 – The track of *Joshu Maru* minutes before and after the collision.

5.11 Damage to the vessels

.1 Upon the collision, *No.3 Dae Kyung* was damaged at the port quarter. The vessel took in water and finally foundered after staying afloat semi-submerged and drifting in water for more than 12 hours until noon 15 November 2009.

.2 *Joshu Maru* incurred some scratches to paintwork and slight indentation in the ship's stem and at the port bow.

6. Conclusions

6.1 At about 2147 local time on 14 November 2009, the Hong Kong registered general cargo ship *Joshu Maru* collided with the Republic of Korea fishing vessel *No.3 Dae Kyung* in approximate position 32°13.70'N 127°21.28'E, about 72 nm southeast of Seogwipo, Jeju-Do, the Republic of Korea.

6.2 At the time of the collision, the weather was cloudy, the visibility was about 3 to 6 nm, the wind was northwest to west force about 7 to 6 and the sea state was rough with heavy swells.

6.3 Following the collision, *No.3 Dae Kyung* took in water, became semi-submerged and finally foundered on the next day. Seven out of the total nine crewmembers onboard were lost (four dead and three missing). The remaining two, the Master and the cook, were rescued by the crew of *Joshu Maru* and afterwards conveyed by Korea Coast Guard to hospital for treatment in Seogwipo. On the other hand *Joshu Maru* incurred some scratches to paintwork and slight indentation in the ship's stem and at the port bow.

6.4 The investigation revealed the following contributory factors:

(i) The Third Officer of *Joshu Maru* did not comply with Rule 7, Rule 8 and Rule 15 of COLREGS[1]. Based on scanty radar information, he first took actions by making a succession of small alterations of course to port just to keep own ship further away from *No.3 Dae Kyung* when he saw the light (the masthead light) of *No.3 Dae Kyung* at about 20° on own ship's starboard bow at ranges of 6 and 3 nm respectively. He did not call the Master even though the movement of *No.3 Dae Kyung* was causing concern afterwards. He continued altering course slowly then hard to port instead of taking action to avoid crossing ahead of *No.3 Dae Kyung* when he saw the red light (the port sidelight) of *No.3 Dae Kyung* at about 20° and 10° on own ship's starboard bow (crossing situation) at ranges of 1.5 and 0.5 nm respectively until collision occurred; and

(ii) The bridge team of *No.3 Dae Kyung* did not comply with Rule 5 of COLREGS. They did not maintain a proper and effective lookout and, consequently, not aware of the presence of *Joshu Maru* until the moment collision occurred.

7. Recommendations

7.1 A copy of the report should be sent to the Korea (Mokpo) Maritime Safety Tribunal and the Korea (Seogwipo) Coast Guard.

7.2 A copy of the report should be sent to the owner/management company, the Master and the Third Officer of *Joshu Maru*.

7.3 A copy of the report should be sent to the owner/Master of *No.3 Dae Kyung*.

7.4 The owner and the management company of *Joshu Maru* are recommended to:

- issue notice/circular to draw the attention of their Masters and Officers to the findings of this report and ensure that

  - they strictly comply with COLREGS at all times, in particular, Rule 7, Rule 8, and Rule 15; and

  - they make proper use of the radar and ARPA facility and its information in collision avoidance.

- clarify the instructions and guidance to their Masters and Officers on the circumstances when the Officer of the Watch should call the Master.

- enhance induction and training programme for bridge watch-keeping officers to ensure that they are aware of and familiar with:

  - the proper use of the bridge mounted main engine and propeller control system, if deem necessary, in adjusting the ship's speed and/or propulsion in collision avoidance; and

  - the need to call the Master at an early stage in the development of any hazardous situation taken into account of the ship's design that the Master's cabin is on the upper deck and it takes about 20 to 30 seconds for the Master to reach the navigating bridge should he be called for assistance.

- establish the procedure for the proper preservation/back-up of the VDR data after significant incident occurred to the ship and ensure that bridge watch-keeping officers are aware of the procedure.

7.5 The Master of *Joshu Maru* should ensure that the recommendations in 7.4 are effectively implemented onboard, with particular focus given to junior and newly joined officers.

7.6 The owner of *No.3 Dae Kyung* should ensure that the Master and the crew comply with COLREGS at all times, in particular, Rule 5 in collision avoidance.

8. Submissions

8.1 In the event that the conduct of any person or organization is commented in an accident investigation report, it is the policy of the Marine Department to send a copy of the draft of the report to that person or organization for their comments.

8.2 The drafts of the report were sent to the following parties:

- The owner/management company, the Master and Third Officer of *Joshu Maru*.
- The owner/Master of *No.3 Dae Kyung*.
- The Korea (Mokpo) Maritime Safety Tribunal and the Korea (Seogwipo) Coast Guard.

8.3 No submission was received from the parties listed in 8.2.

（フィリピン共和国）

TANGGAPAN NG KOMANDANTE

(OFFICE OF THE COMMANDANT)

PUNONGHIMPILAN TANOD BAYBAYIN NG PILIPINAS

(HEADQUARTERS PHILIPPINE COAST GUARD)

139 25th Street, Port Area

Manila

RE: Capsizing of MBca "ROLIV" on 12 November 2008 at the vicinity of Brgy. Bangonon, Concepcion, Iloilo

SBMI Case No. 005-08

DECISION

The Board of Marine Inquiry (BMI) review of the Special Board of Marine Inquiry (SBMI) -Coast Guard District Western Visayas (CDGWV) Marine Accident Investigation Report on the Capsizing of M/Bca "ROLIV" on 12 November 2008 at the vicinity of Brgy. Bangonon, Concepcion, Iloilo is hereby submitted to the undersigned in his capacity as the Commandant, Philippine Coast Guard.

The BMI, upon review of the Findings and Recommendations of the SBMI-CGDWV Report dated 20 January 2009, fully concurred to the said SBMI's findings that the proximate cause of the accident is that the vessel was not seaworthy at the time of her fateful voyage on 12 November 2008. However, on the issue of the immediate cause of the capsizing, the BMI disagreed on the findings of the SBMI and concluded that the immediate cause of the capsizing was the breaking of the outrigger of M/Bca "ROLIV" thereby causing imbalance on the stability of the subject vessel.

All the other findings, conclusions and recommendations of the SBMI were concurred by the BMI, there being no apparent reason to negate the same and that the said approval of the latter is premised on the fact that the same is fully supported by facts and applicable laws on the matter.

After thorough evaluation of the BMI Review of the Findings and Recommendations of SBMI - CGDWV, the undersigned fully sustains and adopts in to the recommendations of the BMI and SBMI-CGDWV as it is legally sufficient and in accordance with the parameters of the law.

This decision shall become final and executory after thirty (30) days upon receipt of the copies by the parties concerned unless a Motion for Reconsideration or Notice of Appeal is filed within the same period.

Let copies of this Decision and the accompanying BMI Review and Maritime Accident Investigation Report of the SBMI-CGDWV, be furnished to the parties and cognizant maritime agencies accordingly.

SO ORDERED.

City of the Manila, Philippines _____

Admiral PCG

"Serving our Nation by 'Ensuring Safe, Clean and Secure Maritime 'Environment"

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
PUNONGHIMPILAN TANOD BAYBAYIN NG PIUPINAS
(Headquarters Philippine Coast Guard)
COAST GUARD LEGAL SERVICE
1 39 25fh Street, Port Area
Manila, 1018

29 December 2009
Date

RE: CAPSIZING OF MBca "ROLIV" on 12 November 2008 SBMI Case No. 005- 08
At the vicinity ot Brgy. Bagongon, Concepcion, Iloilo

NOTICE OF ORDER / DECISION

TO:

Olivia Padrillan
Florentino Padrillan
Owner

Brgy. Bagongon, Concepcion, Iloilo

Greetings:

Please take notice that on 29 December 2009, a decision / order copy attached, was rendered by the Commandant, Philippine Coast Guard on the above entitled case the original of which is now on file in this office.

Very truly yours,

REPUBLIC OF THE PHILIPPINES
Department of Transportation and Communications
Philippine Coast Guard
HEADQUARTERS COASTGUARD DISTRICTWESTERN VISAYAS
Bo. Obrero, Iloiio City

SPECIAL BOARD OF MARINE INQUIRY

CAPSIZING OF M/BCA "ROLIV" CASE NO. 005-2008

FINDINGS AND RECOMMENDATIONS

Ⅰ. AUTHORITY

The Board assumed authority and jurisdiction over this case on the basis of the Memorandum of Agreement entered into between the Maritime Industry Authority (MARINA) and the Philippine Coast Guard (PCG) on 14 September 2005 and Republic Act No. 5173, An Act Creating a Philippine Coast Guard Prescribing Its Powers and Functions, Appropriating the Necessary Funds therefor, and for Other Purposes as amended by the Presidential Decree No. 601 also known as the Revised Coast Guard Law of 1974.

Ⅱ. FACTUAL ANTECEDENTS

Initial reports disclosed that the ill-fated M/BCA "ROLIV" left Conception Fishing Port on November 12, 2008 at around 12:30 o'clock in the afternoon. She was bound for Brgy. Bagongon, Conception, Iloilo, an island barangay adjacent to Conception proper. At around one o'clock in the afternoon of the same date, while M/BCA "ROLIV" was underway, her engine conked out when she encountered strong winds and heavy waves which caused both her outriggers to break and eventually overturned her about two hundred (200) meters away from her destination.

Ⅲ. BACKGROUND INFORMATION ON M/BCA "ROLIV"

A. Vessel Particulars

The Certificate of Vessel Registry of M/BCA "ROLIV" (Exh "M - Board") reveals the following pertinent entries, to wit:

Name of Vessel	M/BCA "ROLIV"
Official Number	ILO0301 0589
Type of Service	Passenger/Cargo
Trading	Coastwise
Homeport	Iollop
Name of Company/Owner	Oliva A. Padrillan

Business Address	Bagongon, Conception, Iloilo
Builder	Arnel Gordon
Year Built	1991
Place Built	Bagongon, Conception, Iloilo
Former Vessel Name	N/A
Former Owner	N/A
Number of Mast	1
Number of Decks	1
Hull Material	wood
Type of Stern	Transom
Type of Stem	Rake
Number of Screw	1
Lenth (Meter)	17.5
Breadth (Meter)	1.81
Depth (Meter)	1.00
Gross Tons	5.64
Net Tons	3.83
No. of Engine	1
Cycle	4
Horsepower	80/59.65
No. of Cylinder	4
Engine Make	Mitsubishi 4DR5 SN 井 184964

B. Vessel's Manning

The herein vessel was manned only by Florentino Padrillan, who acted both as her Boat Captain and Marine Diesel Mechanic. He is the husband of Ofiva A. Padrillan, the Registered Ship Owner of M/BCA "ROLIV".

Ⅳ. PROCEEDINGS

The Board, in the conduct of its administrative investigation and adjudication, is not bound by the strict rules of evidence. Nonetheless, the Rules of Court applies by analogy or in a suppletory character and whenever practical and convenient.

The proceedings of the Board in this case consisted of open public hearings. The Registered Ship Owner and the Boat Captain, were directed to testify before the Board on November 12, 2008. Prior to their testimonies, the Board advised both of them of their right to be assisted with a counsel of their own choice. However, both the aforementioned expressed their willingness to testify on their own even without a lawyer. The Board categorically explained to both of them the importance and possible consequences of their testimonies; hence, the Board required them to engage the services of a lawyer to assist them in the case. For that matter, the Board gave both of

them more time by setting another date on November 24, 2008 for their oral testimonies. Unfortunately, the November 24, 2008 hearing was postponed to December 12, 2008 due to unforeseen conflict in the schedules of the Board Members. Nonetheless, when both the aforementioned appeared again on the said December 12, 2008 hearing, they still did not have a lawyer with them. Instead, they reiterated their intention to testify with out a lawyer. Again, the Board endeavored to explain to them in their own dialect to make them understand clearly their right to have a lawyer and that their testimonies may be used for or against them by the Board or in any other court of law. Both manifested that they understood the same. Considering that they were given already more than sufficient time to obtain the services of a lawyer, the Board deemed it proper to proceed already with the oral testimonies of both the aforementioned.

In addition, the Board summoned other witnesses and resource persons to assist and provide important information needed for the determination of factual and legal issues involved in the herein case.

A. Witnesses

During the aforementioned hearings, the following were summoned and required to testify before the Board as witnesses and/or resource persons, to wit:

1.	OLIVA A. PADRILLAN	-	Registered Owner
2.	FLORENTINO PADRILLAN	-	Boat Captain
3.	MI LAGROS SALUNDAGIT-FLORES	-	Survivor
4.	CAROLINA PANDAY	-	Survivor
5.	EVELYN ESPANOLA	-	Survivor
6.	TERESITA TABO-TABO	-	Survivor
7.	PO1 Antonio Q Franco PCG	-	Petty Officer In-charged PCG Detachment Ajuy, Lloilo
8.	CAPT EDUARDO D FABRICANTE PCG	-	Former Commander Coast Guard Station Lloilo

B. Documents Submitted as Documentary Evidences

The certificates and licenses of M/BCA "ROUV" and other pertinent documents submitted to the Board as documentary evidences consist of the following, to wit:

Exhibit "A andSeries—Board" - Joint Affidavit dated November 2008 executed by Teresita G. Tabo-Tabo, et.al;

Exhibit "B andSeries—Board" - Sworn Affidavit of PO1 Antonio Q. Franco PCG dated 10th day of November 2008 in Iloilo City, Philippines;

Exhibit "C and Series—Board" - Sworn Affidavit of CAPTAIN EDUARDO D FABRICANTE PCG dated 09 November 2008 at Iloilo City, Philippines;

Exhibit "D—Board" - PAGASA Severe Weather Bulletin Number Two issued at ll:00 am, 06 November 2008;

Exhibit "E and Series—Board" - Memorandum of Agreement between PCG and MARINA dated 14 September 2005

Exhibit "F and Series—Board" - PCG Memorandum Circular Number 09-05 on Implementing Guidelines for the PCG-MARINA Memorandum of Agreement on the Implementation of Ship Safety Functions Under R.A. 9295 dated 22 September 2005;

Exhibit "G and Series—Board" - Memorandum to All District/Station Commanders from Commandant, PCG on the Subject Implementing Guidelines on PCG-MARINA Memorandum of Agreement dated 23 September 2005;

Exhibit "H and Series—Board" - PCG Memorandum Circular No. 06-08 on Interim Guidelines on Movement of Vessels during Heavy Weather dated 30 June 2008;

Exhibit "I—Board" - Letter from MARY ANN ARMI Z. ARCILLA, Regional Director, MARINA Region VI, address to CAPT. BON DAN D. CHAN, Chairman, SBMI, dated 08 December 2008"

Exhibit "J and Series—Board" - Joint Affidavit executed by FLORENTINO PADRILLAN and OLIVA PADRILLAN;

Exhibit "K—Board" - Affidavit of Ownership executed by OLIVA A. PADRILLAN subscribed and sworn to before HON. MATEO B. BALDOZA, SR., 3rd MCTC Judge Sara-Ajuy-Lemery, on the 28th day of May 2003;

Exhibit "L—Board" - Certificate of Ownership issued by MARINA at Iloilo City on 23 July 2003;

Exhibit "M—Board" - Certificate of Vessel Registry issued by RINA at Iloilo City on 23 July 2003;

Exhibit "N— Board" - Tonnage Measurement Certificate issued by MARINA at Iloilo City on 23 July 2003;

Exhibit "O—Board" - Letter from MARY ANN ARMI Z. ARCILLA Regional Director, MARINA Region VI, address to OLIVA A. PADRILLAN dated 23 July 2003;

Exhibit "P—Board" - Transverse Section of M/BCA "ROLIV" dated April 10, 2003;

Exhibit "Q—Board" - Application for Admeasurement/ Re-admeasurement signed by OLIVA A. PADRILLAN;

Exhibit "R—Board" - Pictures of M/BCA "ROLIV";

Exhibit "S—Board" - Certificate for Boat Passenger issued by RENE C. GABAYERON, Barangay Captain, Barangay Bagongon, Municipality of Conception, Iloilo, dated 14 July 2003;

Exhibit "T and Series—Board' - Letter from MARY ANN ARMI Z. ARCILLA, Regional Director MARINA 6, to CAPT BON DAN D CHAN PCG, Chairman, SBMI dated 19 January 2009.

V. ISSUES

1. What caused the capsizing of M/BCA "ROLIV"?

2. Whether or not there was negligence on the part of the Register Ship Owner and/or the Boat Captain of M/BCA "ROLIV"?

3. Whether or not the Registered Ship Owners and/or Boat Captain of M/BCA "ROLIV" can be held administratively liable for her capsizing.

Ⅵ. DISCUSSIONS

A. Analysis of Facts

1. Voyage of M/BCA"ROUV"

From the testimonies of witnesses and documentary evidences obtained in the instant case, the Board determined that last November 6, 2008 at around ll:30 o'clock in the morning, M/BCA "ROLIV" departed at the Fishing Port of Concepcion, Iloilo on her way to Brgy. Bagongon, Concepcion, Iloilo.

According to the Boat Captain, when they departed the weather was fair and the sea was calm. He was corroborated by Milagros Salundagit-Flores, one of the passengers, who testified that when they left Conception the sea was calm and there was no wave (p. 6 TSN dated Nov.12, 2008). The said observation may have been true; however, perusal of PAGASA Severe Weather Bulletin Number Two issued at ll:00 am, 06 November 2008 (Exh "D-Board") would reveal the presence of Tropical Depression "Quinta" in the area of responsibility of the Philippines and Public Storm Warning Signal (PSWS) No 1 was already raised in the area ofVisayas including Ifoilo. The Boat Captain, at first claimed no knowledge of the aforementioned weather condition. However, upon further inquiry, he eventually admitted knowledge of the same as shown by the following testimony:

Q: When you departed from Conception to Bagongon, did you know if there was a low pressure?
A: I did not know sir.

Q: No passenger has told you that there was a low pressure?
A: None sir, because the weather was good and there was no rain and the sea was calmed.

Q: Did somebody tell you that there was a low pressure?
A: When we were going home to Bagongon, I knew that there was a low pressure but the weather was good and I did not think that it will happen to us.

(p. 7 TSN dated Dec. 12, 2008)

Relative to the aforementioned, it should be noted that the PCG issued Memorandum Circular Number (MC No.) 06-08 (Exh "H and Series - Board) on, "Interim Guidelines on the Movement of Vessels during Heavy Weather". Under para V on Policy of the same, it is provided that:

"No vessel of any type or tonnage shall be allowed to sail except to take shelter, as the situation may warrant, when Public Storm Warning Signal Number 1 or higher is hoisted within its point of origin, the intended route, and point of destination." x x x

From the testimony of the Boat Captain, it was determined by the Board that M/BCA "ROLIV" had forty four (44) passengers including children at the time of her departure and that she was also loaded with seven (7) sacks of rice. Moreover, the Boat Captain explained that M/BCA "ROLIV" has capacity for sixty (60) passengers. (p. 3 TSN dated Dec. 12, 2008). Further, thru the various accounts of passengers of M/BCA "ROLIV" who testified before the Board, the testimony of the Boat Captain was confirmed that during the said voyage she had forty-four (44) passengers including four (4) children on board. The Board can only rely on the testimonies of the aforementioned as to the number of passengers because M/BCA "ROLIV" had no passenger manifest. This is clear in the following testimony of Milagros Salundagit-Flores, to wit:

Q: When you departed from Conception how many passengers were there?
A: There were 44 passengers including 4 children.

Q: Roliv has passenger manifest?
A: None sir.

(p. 5 TSN dated Nov. 12, 2008)

Based on the aforementioned testimonies, the Board determined that at the time of her departure, M/BCA "ROLIV" was not "overloaded". This is also supported by personal accounts of one of the witnesses, Teresita Tabo-tabo, who testified that on their voyage to Bagongon, M/BCA "ROLIV" was not overloaded because there were only 40 passengers and 6 sacks of rice on board {(p. 14 TSN dated Nov. 12, 2008). Another passenger, Evelyn Espanola, testified in support of the same, that:

Q: How do you say that she is not full?
A: Because there were benches that were not occupied by the passengers.

Q: Why?
A: Because you can see the markings on the side.

(p. 12 TSNdated Nov. 12, 2008)

With regard to the life jackets on board M/BCA "ROUV", the Boat Captain claimed that there were life jackets on board her. This was made evident in the following testimonies:

Q: Do you have lifejackets in your banca?
A: There were but they were torn out.

Q: You did not buy again?
A: No, sir because I requested my sister-in-law to buy for me in Bacolod but she was not able to buy.

Q: So, in other words on Nov. 6, your pump boat has no lifejacket?
A: There were but only few.

Q: And your passengers did not use it?
A: No, sir.

(p. 3 TSN dated Dec. 12, 2008).

Unfortunately, the aforementioned claim by the Boat Captain is contradicted by the testimonies of the passengers before the Board. Instead, it was found out by the Board that M/BCA "ROLIV" had no life-jackets available for the passengers. This was manifest from the following testimony of Milagros Salundagit-Flores, to wit:

Q: Did you see any life jacket?
A: I did not see.

Q: When you were in the sea did you see lifejackets?
A: No sir only container.

(p. 5 TSN dated Nov. 12, 2008).

On the part of Carolina Panday, one of the passengers of M/BCA "ROLIV", she atso testified when asked about the life jackets that:

Q: From the time you were riding Roliv and up to the time it capsized, did you see a lifejacket?
A: Yes sir.

Q: Are you sure?
A: No, sir it was container.

Q: How about life ring did you see any?
A: No, sir.

(p. 8 TSN dated Nov. 12, 2008)

Around thirty (30) minutes after M/BCA "ROLIV" departed from the fishing port of Conception, the Boat Captain noticed smoke coming from the cylinder head of her engine because the gasket was burned causing the engine to stop operating (Joint Affidavit of Florentine Padrillan and Oliva Padrillan - Exh "J-Board"). The same resulted also to M/BCA "ROLIV" being dead on the water. According to Carolina Panday, the Boat Captain tried to repair the engine but was unable to re-start the same (p.9 TSN dated Nov. 12, 2008). Fortunately, another Motor banca, M/BCA ULIA, was behind them and also on the way to Bagongon, Conception. The said M/BCA LILIA is owned by Esperidion Padrillan, brother of the Boat Captain, who at that time was also a passenger of M/BCA

"ROL1V" (Exh "J-Board). The Boat Captain of M/BCA "ROLIV" asked assistance from M/BCA ULIA. Then, M/BCA LILIA tied a rope to the outrigger of M/BCA "ROLIV" and towed her towards their destination (Joint Affidavit of Teresita Tabo-Tabo, et. a!. - Exh "A-Board").

However, while M/BCA "ROLIV" was being towed by M/BCA LILIA, the wind became stronger and the waves became bigger already (Joint Affidavit - Exh "J - Board"). Thereafter, at about 1 :20 o'clock in the afternoon of November 6, 2008, both vessels were already at the vicinity of Sitio Olpok, Brgy. Bagongon, Conception, Iloilo and more or less 200 meters away from the shore line when suddenly the rope that was tied in the outrigger of M/BCA "ROLIV" connecting to the towing boat M/BCA LiLIA was cut because of the strong wind and big waves. Unfortunately, because of strong and heavy waves, M/BCA LILIA was unable already to turn back towards M/BCA "ROLIV". For the said reason, M/BCA "ROHV" was again merely floating on the sea without power and propulsion of her own. The situation was aggravated when the right outrigger of M/BCA "ROLIV" was removed and as the waves continued to batter her, the left outrigger threatened to be removed also. The Boat Captain jumped to the water in an effort to tie the outriggers to prevent the same from being removed. Unfortunately he was unsuccessful because the waves were high already and he was struck by the bamboo outrigger. As a result he sunk under water (Joint Affidavit of Teresita Tabo-Tabo, et. al. - Exh "A-Board"). Eventually, when both the outriggers of M/BCA "ROLIV" were removed from her already, the inevitable happened. M/BCA "ROLIV" capsized.

To reiterate what was previously discussed herein, M/BCA "ROLIV" was not equipped with life jackets. What saved the lives of some of the passengers were merely plastic containers which they used as life jackets. One of the witnesses, Carolina Panday, testified that:

Q: How many containers did you see?
A: I did not know, but I saw the container where the crude oil was placed.

Q: How big is the container?
A: It is a 20 liters container.

Q: Your daughter was saved?
A: Yes, sir.

(p. 9 TSN datedNov. 12, 2008)

Regrettably, as a result of the herein unfortunate capsizing of M/BCA "ROLIV", out of her forty four (44) passengers, there were fourteen (14) casualties but none of them is missing.

2. Documentary Requirements

M/BCA "ROLIV" was shown to be in possession of the following Licenses and Certificates, to wit

License/ Certificate	Issuing Authority	Date and Place of Issue	Validity	Exhibit	Fees & Charges (MARINA MC Nos. 2005-001 & 2008-06)
Certificate of Ownership	Marina	23rd July2003		L-Board	P600 + P3.00/GT
Certificate of Vessel Registry	Marina	23rd July 2003		M-Boa rd	P600 + P3.00/GT
Tonnage Measurement Certificate	Marina	23rd July 2003		N-Board	P390.00

Unfortunately, the aforementioned are not complete. Based on the expert opinion issued by MARINA (Exh "T and Series - Board"), the following licenses and certificates are additionally required from M/BCA "ROLIV" to be able to operate legally:

Licenses & Certificates	MARINA Policies & Circulars	Fees & Charges (MARINA MC Nos. 2005-001 & 2008-06)
Certificate of Public Convenience	R.A. 9295 (also known as the "Domestic Shipping Development Act of 2004)	P4.50/GT or minimum of P1 ,560.00
Passenger Ship Safety Certificate	M.C. # 203 (Rules Governing the Implementation of the ship Safety Inspection System)	Pl,500.00
Minimum Safe Manning Certificate	M.C. # 148 (Amendments to Chap. XVIII of the Philippine Merchant Marine Rules and Regulations (PMMRR) 1997 on Minimum Safe Manning for ships in the domestic Trade)	P130.00
Exemption Certificate	M.C. # 203 (Rules Governing the Implementation of the ship Safety Inspection System)	P300.00/ P1,500.00
Bay and River License	M.C. # 110 (Guidelines for the Issuance/ Renewal of Coastwise License [CWL], Bay and River License [BRL] and Pleasure Yacht License [PYL])	P4. 00/GT

When the registered ship owner was questioned by the Board on the licenses and certificate of M/BCA "ROLIV" she testified as follows:

Q: Do you have permit to operate this pump boat?
A: Every January from the Municipal Bldg. of Conception.

Q: When is the expiration?
A: Every January.

Q: How much do you pay?
A: Before January less than 1 ,000 but after January it is 1,200.

Q: From MARINA?
A: None, sir.

Q: Do you have franchise?
A: None, sir.

(p. 9 TSN dated December 12, 2006)

Q: Why you did not go to MARINA to renew your license?
A: Because we lacked money.

Q: But you know that you can not have your pump boat ply from Bagongon to Conception knowing that your license is lacking?
A: Because we pity also the other passengers.

(p. 12 TSN datedDec. 12, 2008)

Apparently, M/BCA "ROLIV" was not earning adequately or profitably. As discovered by the Board from the testimony of the Boat Captain their fare was not fixed and sometimes they did not even charge any fare from their passengers because most of their passengers are also their relatives. The aforementioned are evident in the following testimony of the boat captain:

Q: Did they pay?
A: Not all because some are our relatives, sometimes they pay P10.

Q: But on Nov. 12, there were four (4) survivors who testified that they paid.
A: If they pay, I accept and if they do not pay it is okey with me.

(p. 2 TSN dated Dec. 12, 2008)

3. Manning Requirements of M/BCA "ROLJV"

In accordance with the expert opinion of MARINA (Exh "T and Series - Board") M/BCA "ROLIV" should have complied with the following Manning Requirements:

a. (1) Boat Captain
b. (1) Marine Diesel Mechanic

Qualification Requirements

1. Filipino Citizen;
2. At least 18 yrs of age;
3. Physically and Mentally Fit as certified by a DOH accredited medical clinic;
4. At least two yrs. Experience as a seafarer; and
5. Should pass a written and oral examination given by the Central and all MARINA Regional Offices.

In relation with the above, the Board found out from the Boat Captain himself that he was acting as Boat Captain and Marine Diesel Mechanic at the same time of M/BCA "ROLIV" (p. 4 TSN dated December 12, 2008). In addition, the testimony of the Boat Captain further revealed the following:

Q: What is your position in Roiiv?
A: I am the boat captain.

Q: Do you have othercrew who helps you?
A: My passenger is the one helping me

Q: You have no regular helper?
A: None, sir.

Q: How many years have you been operating?
A: About 6 years.

Q: Did you undergo training?
A: No, sir.

Q: Do you have license to operate?
A: None sir. Only experience.

Q: In your 6 years, did you not try to get a license?
A: No sir because our income is not enough.

(p. 7-8 TSN dated Dec. 12, 2008)

B. Relationship of PCG and MARINA in relation to Vessel Safety vis-a-vis the herein Case of M/BCA "ROLIV"

1. Pertinent Laws Governing the Vessel Safety functions of PCG and MARINA

It is a settled rule that at present the Vessel Safety Functions used to be performed by the PCG by virtue of Republic Act No. 5173 (An Act Creating a Philippine Coast Guard. Prescribing its Powers and Functions, Appropriating the Necessary Funds therefor, and for other Purposes) and Presidential Decree No. 601 (also known as Revised Coast Guard Law of 1974) are now under the jurisdiction of MARINA by virtue of Republic Act No. 9295 (known as the Domestic Shipping Development Act of 2004). Under the said R.A. 9295 it is expressly provided that:

"Sec. 9. Safety Standards. - All vessels operated by domestic ship operators shall at all times be in seaworthy condition properly equipped with adequate life-saving, communication, safety and oiher equipment operated and maintained in accordance with the standards set by MARINA, and manned by duly licensed and competent vessel crew.

The MARINA shall have the power to inspect vessels and all equipment on board to ensure compliance with safety standards.

Sec. 10. Jurisdiction; Power; and Duties of MARINA – The MARINA shall have the power and authority to:

(1) Register vessels;

(2) Issue certificates of public convenience or any extensions or amendments thereto, authorizing the operation of all kinds. Classes and types of vessels in domestic shipping: Provided, That no such certificate shall be valid for a period of more than twenty-five (25) years;

(3) Modify, suspend or revoke at any time upon notice and hearing, any certificate, license or accreditation it may have issued to any domestic ship operator;

(4) Establish and prescribe routes, zones or areas of operations of domestic ship operators;

(5) Require any domestic ship operator to provide shipping services to any coastal area, island or region in the country where such services are necessary for the development of the area, to meet emergency sealrft requirements, or when public interest so requires;

(6) Set safety standards for vessels in accordance wtth applicable conventions and regulations;

(7) Require all domestic ship operators to comply with operational and safety standards for vessels set by applicable conventions and regulations, maintain its vessels in safe and serviceable conditions, meet the standards of safety of life at sea and safe manning requirements, and furnish safe, adequate, efficient, reliable and proper service at all times;

(8) Inspect all vessels to ensure and enforce compliance with safety standards and other regulations;

(9) Ensure that aJJ domestic ship operators sha)i have the financial capacity to provide and sustain safe, reliable, efficient and economic passenger or cargo service, or both;

(10) Determine the impact which any new service shall have to the locality it will serve;

(11) Adopt and enforce such rules and regulations which will ensure compliance by every domestic ship operator with required safety standards and other rules and regulations on vessel safety;

(12) Adopt such rules and regulations which ensure the reasonabfe stability of passengers and freight rates and, if necessary, to intervene in order to protect public interest;

(13) Hear and adjudicate any complaint made in writing involving any violation of this law or the rules and regulations of the Authority;

(14) Impose such fines and penalties on, including the revocations of licenses of any domestic ship operator who shall fail to maintain its vessels in safe and serviceable condition, or who shall violate or fail to comply with safety regulations;

(15) Investigate any complaint made in writing against any domestic ship operator, or any shipper, or any group of shippers regarding any matter involving violations of the provisions of this Act;

(16) Upon notice and hearing, impose such fines, suspend or revoke certificates of public convenience or other license issued, or otherwise penalize any ship operator, shipper or group of shippers found violating the provisions of this Act; and

(17) Issue such rules and regulations necessary to implement the provisions of this Act: Provided, That such rules and regulations cannot change or in any way amend or be contrary to the intent and purposes of this Act." (Emphasis supplied)

Clearly from the aforementioned cited provisions, the licenses and certificates of M/BCA "ROLIV", including the implementation and enforcement of the same, are under the jurisdiction of MARINA now. Unfortunately, MARINA is unable to perform the said functions particularly the enforcement aspect of the same; hence, MARINA initiated the signing of a Memorandum of Agreement on September 14, 2005 (Exh "E and Series - Board) with PCG to assist the latter in the performance of its vessel safety functions. Immediately, the PCG issued Memorandum Circular Number 09-05 on Implementing Guidelines for the PCG-MARINA Memorandum of Agreement on the Implementation of Ship Safety Functions under R.A. 9295 dated 22 September 2005 (Exh "F and Series - Board). In providing assistance to MARINA in the performance of specific ship safety enforcement activities, it is expressly stated therein that;

"C. Enforcement Functions

1. PCG shall assist MARINA in the conduct of enforcement activities enumerated below, prior to the ship's departure and while the ship is underway only. Moored vessels without an intended voyage are excluded from this provision. The phrase "prior to the ship's departure" shall be reckoned from the tie the master has submitted his Master's Oath of Safe Departure."

xxx

From the aforementioned it is clear that as a pre-requisite for PCG Personnel to be able to conduct enforcement activities on behalf of MARINA, the Master's Oath of Safe Departure must first be received by the said PCG Personnel.

2. Coast Guard Station Iloilo under the Command of CAPT EDUARDO D FABRICANTE PCG

The Station Commander of Coast Guard Station Iloilo at the time of the herein incident was CAPT EDUARDO D FABRICANTE PCG. From the affidavit of said CAPT FABRICANTE, the Board found out that even at the onset of Tropical Depression "Quinta" he was already monitoring and checking constantly the website of PAG-ASA even when the same was still a Low Pressure Area on the evening of Nov. 5, 2008. That when PSWS # 1 was eventually raised in his area of responsibility on or about ten o'clock of November 6, 2008, he immediately instructed the duty radioman to disseminate it to the detachments and to call up radio networks for the purpose of widest dissemination of the same (Exh "C and Series - Board). This is further elucidated in the testimony of said CAPT FABRICANTE:

Q: On November6, 2008 you are the Station Commander?
A: Yes, sir.

Q: Can you tell us what the weather condition was during that day?

A: In the morning of Nov. 6, I was aware that there was a weather disturbance. It was a low pressure area and that even before the night of Nov. 5, it was already located at the part of Surigao, near Masbate. It was only at past 10:00 in the morning that there was already Signal No. 1 in Ilorlo and Guimaras.

Q: How did you find out about the weather disturbance?
A: We received a weather bulletin from PAGASA that it was signal no. 1 in Iloilo and Guimaras.

Q: Upon finding out that there is a signal no. 1, what were the actions taken?
A: Upon receipt, I instructed my radio man to disseminate the information and on my part since I have a cell phone I texted during that time. I was at the station and at that time also CAPT CHAN, the Deputy District Commander was also there and he witnessed how I give order to P/ENS DEL ROSARIO and Chief Solo.

(p. 26-27 TSN dated Nov. 12, 2008)

Moreover, CAPT FABRICANTE intimated also that he ordered his personnel to immediately call all vessels and/or the offices of vessels which are about to transit from Iloilo to Guimaras and vice-versa to immediately ceased from sailing (p. 27 TSN dated Nov. 12, 2008)

From the aforementioned discussions, the Board determined that CAPT FABRICANTE had done what is necessary to disseminate the information as regards the PSWS # 1 hoisted at the area of responsibility of his station. Moreover, perusal of Memorandum Circular Number 09-05 (Exh "F and Series - Board) would show that he is not required to direct his personnel to actually inspect and/or board all vessels in their respective areas of jurisdiction for the purpose of dissemination about the weather condition. His order to immediately call all vessels and/or the offices of said vessels to immediately cease from sailing is substantive compliance with the actual boarding of said vessels for the same purpose. Besides, no vessel is supposed to depart without submitting her MOSD first at the PCG Station or Detachment. Hence, the only way for a vessel not to be informed by the PCG as regards the weather condition is for her to violate the MOSD requirement and depart without clearance from the PCG - which was exactly what was done by M/BCA "ROLIV". Hence, in the interest of fairness and justice, the Board determined that CAPT FABRICANTE can not be held liable for negligence in the performance of his duty as Station Commander.

3. Coast Guard Detachment Ajuy under PO1 Antonio Q Franco PCG

At the time of the herein incident, Coast Guard Detachment Ajuy was under PO1 Antonio Q Franco as Petty Officer In-charge. From the Sworn Affidavit of said PO1 Franco the Board determined that on November 6, 2008 at around 12:00 o'clock in the afternoon he was together with PO2 Alex B Sajo PCG at Culasi Pier to give advice to ship owners/master of the vessel and all

departing passengers that there is PSWS # 1 in Iloilo and that they are not allowed to sail for safety purposes. Thereafter, they immediately proceeded to Banate Port to advise the ship operators and passengers who were scheduled to depart at 2:30 o'clock in the afternoon of the same day about the PSWS # 1 in iloilo and that they are not also allowed to depart for safety reasons (Exh "B and Series - Board).

According to PO1 Franco, they conducted pre-departure Inspection at Culasi Pier and Banate Port only because it is only in those ports where there are regular trips of vessels. They did not conduct pre-departure inspection at Conception Feeder Port because there is no vessel operating in the said area as no ship operator has been issued permit and franchise to operate by MARINA. Further, according to him, they only conduct pre-departure inspection when there is an MOSD submitted to them by the Master of the vessel (Exh "B and Series - Board) and at that they never received any MOSD from the M/BCA "ROUV".

It is already settled from the previous discussions in accordance with Memorandum Circular Number 09-05 (Exh "F and Series - Board) that PCG Personnel are authorized only to conduct enforcement function on vessel safety upon receipt of MOSD from the vessel. However, the Board considered also that said PO1 Franco was not remised with his duty as POIC of the Detachment as he was actually engaged in the performance of the same. Considering the limitation of the number of personnel of the detachment they have to cover three ports located in three towns and there are only two of them at the detachment. Considering further the distances of the said towns from the other and the schedule of departures at the two towns (Culasi and Banate), it become physically impossible then for them to still go to the Port of Conception when they have not received any MOSD from the said port. Indeed, with the personnel limitation of Coast Guard Detachment Ajuy, it is not reasonable to expect them to still go to the Port of Conception when they know that it has no finer route, meaning there are no passenger vessels expected to depart from the said fishing port.

In view of all the aforementioned, the Board can not also attribute negligence on the part of PO1 Franco for the herein incident. He merely obeyed the order of the PCG Command. It this case it was explicitly expressed in Memorandum Circular Number 09-05 (Exh "Fand Series - Board) and in capsule it says: No MOSD – No enforcement activity on behalf of MARINA.

The Director of MARINA 6, Director MARY ANN ARMI Z. ARCILLA, was summoned by the Board to appear and testify as resource person in order to shed light on this matter. However, it is unfortunate that the hearing of the Board was not accommodated by Director ARCILLA Her insights would have been invaluable towards the development of policies for the prevention of similar maritime incidents in the future.

Ⅶ. FINDINGS

A. With respect to the first issue herein as to what caused the sinking of M/BCA "ROLIV" the Board was able to determine the following factors, to wit:

1. Proximate Cause

Proximate Cause under the Deluxe Black's Law Dictionary 6th Edition, St. Paul Minn. West Publishing Co. 1990 is defined as:

> "That which, in a natural and continuous sequence, unbroken by any efficient intervening cause, produces injury, and without which the result would not have occurred. (Wisniewski v. Great Atlantic & Pac. Tea Co., 226 Pa.Super. 574, 323 A.2d 744, 748). x xx An injury or damage is proximately caused by an act, or a failure to act, whenever it appears from the evidence in the case, that the act or omission played a substantial part in bringing about or actually causing the injury or damage; and that the injury or damage was either a direct result or a reasonably probable consequence of the act or omission"

In this case, the Board determined that the proximate cause of the capsizing of M/BCA "ROLIV" was the indubitable fact that she was not Seaworthy. To expound on what is a Seaworthy vessel, a definition of the same is necessary. Again, under the aforementioned Dictionary, Seaworthy means:

> "Ability to withstand ordinary stress of wind, waves and other weather which the vessel might normally be expected to encounter. (Miles v. Royal Indem. Co., Tex. Civ.App., 589 S.W.2d 725, 729). This adjective, as applied to a vessel signifies that she is properly constructed, prepared, manned, equipped, and provided, for the voyage intended (Robichaux v. Kerr McGee Oil Industries, D.C.La., 317 F.Supp. 587, 591). A seaworthy vessel must, in general, be sufficiently strong and staunch and equipped with appropriate appurtenances to allow it to safely engage in trade for which it was intended (Texaco v. Universal Marine, Inc., D.C.La., 400 F.Supp. 311, 320)."

From all the evidences obtained by the Board, it was clearly established that M/BCA "ROLIV" was not seaworthy in accordance with the aforementioned definition. To begin with, she did not possess all the required licenses and certificates to be able to operate legally. Non-possession of the same necessarily implies that she has not undergone the necessary inspections and evaluations to determined her readiness for sea travel, (n addition, she was not properly manned by competent and required number of officers. M/BCA "ROLIV" was manned by one person only who both acted as boat captain and marine diesel mechanic at the same time without being qualified for either of the two positions.

In addition, it was shown by the passengers of M/BCA "ROLIV" who testified before the Board that she had no lifejackets for them; hence, it can definitely be said that she was not properly equipped and provided for the voyage.

Finally, the ultimate factor that determined M/BCA "ROLIV" not to be seaworthy was the failure of her engine, ft should be noted that M/BCA "ROLIV" capsized at around 200 meters away from the shoreline of her intended destination. If her engine did not fail, she would not have been dead on the water without own power and propulsion. She would not have needed to be towed by another vessel which made their travel significantly slower. Then, she would have been able to cover that remaining 200 meters and reach her destination before the wind became strong and the waves became bigger.

2. Immediate Cause

Immediate Cause under the same aforementioned Dictionary is expressly defined as:

> "The last of a series or chain of causes tending to a given result, and which, of itself, and without the intervention of any further cause, directly produces the result or event." x x x

Notwithstanding the aforementioned discussion on Proximate Cause of M/BCA "ROLIV" being not seaworthy, the Board can not ignore the fact that what directly caused her capsizing were the strong winds and big waves brought about by Tropical Depression "Quinta" that battered her. However, it is settled that this could not have happened if only M/BCA "ROUV" was seaworthy.

B. Whether or not there was negligence on the part of registered owner and boat captain of M/BCA "ROLIV".

In this issue, the Board ruled on the affirmative. The Board determined that both the registered owner and the boat captain were guilty of Gross Negligence. Under the same aforementioned Dictionary, Gross Negligence is defined as:

> "The intentional failure to perform a manifest duty in reckless disregard of the consequences as affecting the life or property of another."

On one hand, the gross negligence of registered owner was manifested on the fact that she knowingly and deliberately failed to obtain the necessary licenses and certificates to be able to operate M/BCA "ROUV" legally. The registered owner also failed to properly man M/BCA "ROLIV" with qualified and required number of officers. Finally, the high number of casualty could be directly attributed to the failure of the registered owner to provide life jackets for the passengers of M/BCA "ROLIV".

On the other hand, the Boat Captain was determined by the Board to be guilty of gross negligence when he undertook to operate M/BCA "ROLIV" both as her Boat Captain and Marine Diesel Mechanic without the required licenses and qualifications for the said positions. Moreover, the Boat Captain already knew there was a tropical depression before they departed for their destination at Bagongon, Conception, yet, he still continued with her voyage.

C. With regards the issue of whether or not both the Register Ship Owner and Boat Captain of M/BCA "ROLIV" can be held administratively liable for her capsizing.

Based on the aforementioned discussions, the Board determined that both the Registered Ship Owner and Boat Captain of M/BCA "ROLIV" can be held administratively liable for her capsizing.

Ⅷ. RECOMMENDATIONS

A. Imposition of appropriate administrative penalties against both the Registered Ship Owner and Boat Captain of M/BCA "ROLIV" by MARINA for their violations of its policies, rules, and regulations on vessel safety;

B. The filing of appropriate criminal charges against both the Registered Ship Owner and Boat Captain of M/BCA "ROLIV" by the concerned personnel of Department of Justice;

C. For the PCG to provide effective administrative penalties under its Memorandum Circular Number 06-08 dated 30 June 2008 on, "Interim Guidelines on Movement of Vessels during Heavy Weather" to ensure its compliance and discourage those who blatantly disregard its provisions;

D. For MARINA to require all motorbancas to paint/post in a conspicuous portion of the same the number of officers and crew required for the particular motorbanca and the maximum number of passengers allowed on board and other pertinent data that can assist the passengers to determine if the motorbanca is safe for voyage;

E. For PCG and MARINA to require all motorbancas to paint/post the hotline numbers of both agencies to enable the passengers to text or call either or both in case of any complaint or violation of the respective policies, rules, and regulations of the said agencies;

F. The case of M/BCA "ROLIV" is most probably happening anywhere else in the country considering that the Philippines is an archipelagic country. Many Filipinos live in islands and rely solely on motorbancas as their mode of transportation. Hence, it is for MARINA to identify these liner routes regularly used by motorbancas in ferrying people and their goods. Then, MARINA should require vessels plying in the said routes to comply with the required certificates and licenses to operate legally;

G. For the concerned Local Government Units to encourage and assist those who have capital to form a cooperative for the operation of motorbanca in order that the operation of the same may be sustained;

H. For MARINA to provide exemptions or lower rates of fees and charges in flavor of the aforementioned cooperatives in order to assist them in the compliance of the legal requirement for operation of motorbancas; and

I. For the PCG to establish detachments in the aforementioned liner routes established by MARJNA to assist the latter in accordance with the Memorandum of Agreement between them dated September 14, 2005 and the PCG Memorandum Circular Number 09-05 on Implementing Guidelines for the PCG-MARINA Memorandum of Agreement on the Implementation of Ship Safety Functions Under RA. 9295 dated 22 September 2005.

RESPECTFULLY SUBMITTED.

20 January 2009, HCGDWV Iloilo City, Philippines.

（大韓民国）

Explosion on the general cargo vessel
Hyundai Continental

Korean Maritime Safety Tribunal

CONTENTS

Summary

The general cargo vessel Hyundai Continental was discharging at the gwangyang, Korea. The First Mate and the other crew stored the paints and thinners wrapped in plastic material on the funnels “A” and “B” locating in the stern area by using a provision crane equipped only for the ship’s stores.
Completing loading the paints and thinners, Captain was negligent of the inspection rounds of the loading area while discharging their cargo. So, Captain was not aware that the paints and thinners were leaking from damaged containers, and that soot and sparks were falling from the funnel onto the paints and thinners.
The fire was founded out by the crew and extinguished.

1. Factual Information

1.1 Vessel Details

Name of Vessel	Hyundai Continental
Port of Registry	Korea
Type	General cargo vessel
Built	January 1988
Classification Society	Korean Registered
Construction	steel
Length Overall	298
Gross Tonnage	101,466
Engine power and type	12,021 KW

1.2 Accident details

Time and Date	2220hrs 27 April 2007
Location of Accident	A t the Gwang yang, Korea
Person on board	18 persons

2. The fire

The Korean-registered general cargo vessel Hyundai Continental was built and launched by the Hyundai Heavy Industries Ltd., located in Ulsan in the province of Gyeongsangnamdo, Korea in January 1988. She was 101,466 G/T, 298.38m in length, 50.00m in width, 24.00m in depth, and powered by one 12,021kw diesel engine. She underwent the 1st class intermediate inspection by the Pohang branch of Korean Register of Shipping on 20th April 2005.

The vessel also received an interim document of compliance valid until 8th March 2007 through the interim test by the Singapore branch of Korean Register of Shipping on 23rd November 2004, which was later extended until 8th May 2007. She was supposed to move to a shipyard in China for

docking repair in early May 2007, after completing a loading and unloading operation in the port of Gwang yang at the end of April that same year.

The vessel was used for navigating from South America, etc. loading iron ore to the port of Gwang yang Korea, etc. where unloading the cargo.

Seeing the construction under the deck of the vessel, from the bow of the vessel, there were a bosun store and a chain locker under which the forecastle store, cargo holds no.1~11, an engine room, and an aft peak tank were located. A bridge and crew spaces structured as 5 stories, were also located on the main deck over the engine room.

The ship was powered by one 12,021kw diesel engine and three 820 h.p. generators. And a funnel(8.80m in length, 24.40m in width, 1820m in height) of engine room for spouting out the combustion materials from the boiler was located on the upper deck higher than the wheelhouse. There were a CO_2 room, a Fire control station, an Emergency Generator room, a Ventilation room, etc. located either to the left or the right side of the funnel.

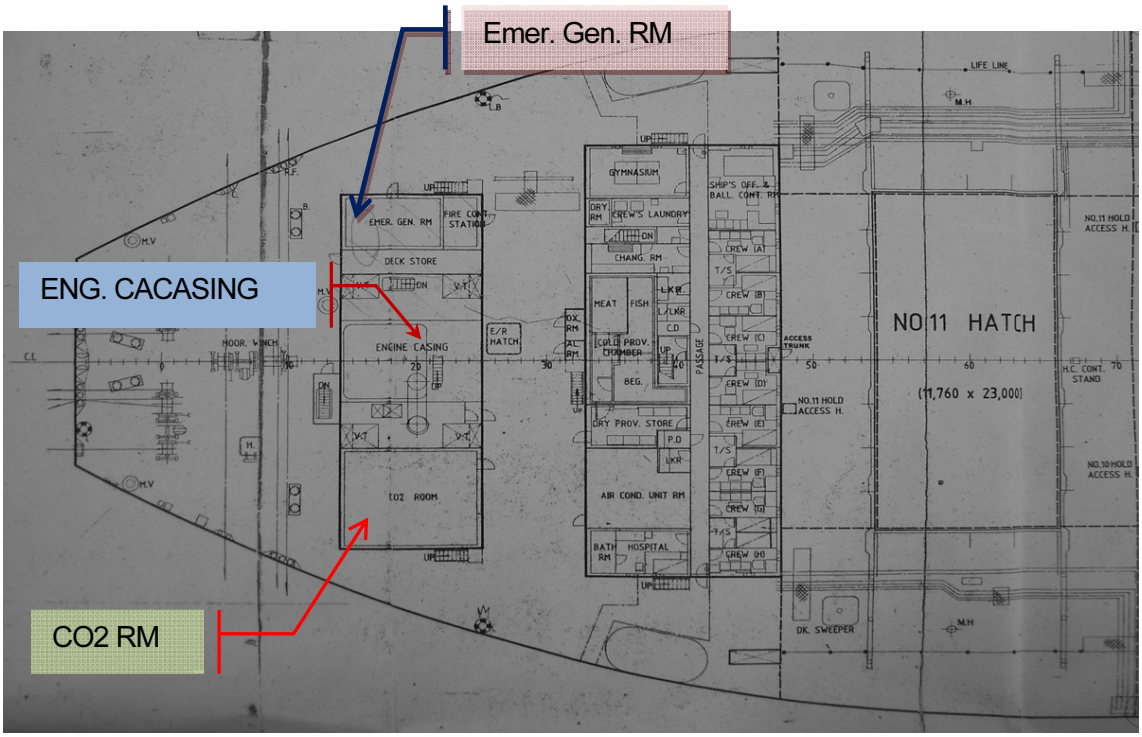


Figure 1 Around the funnel

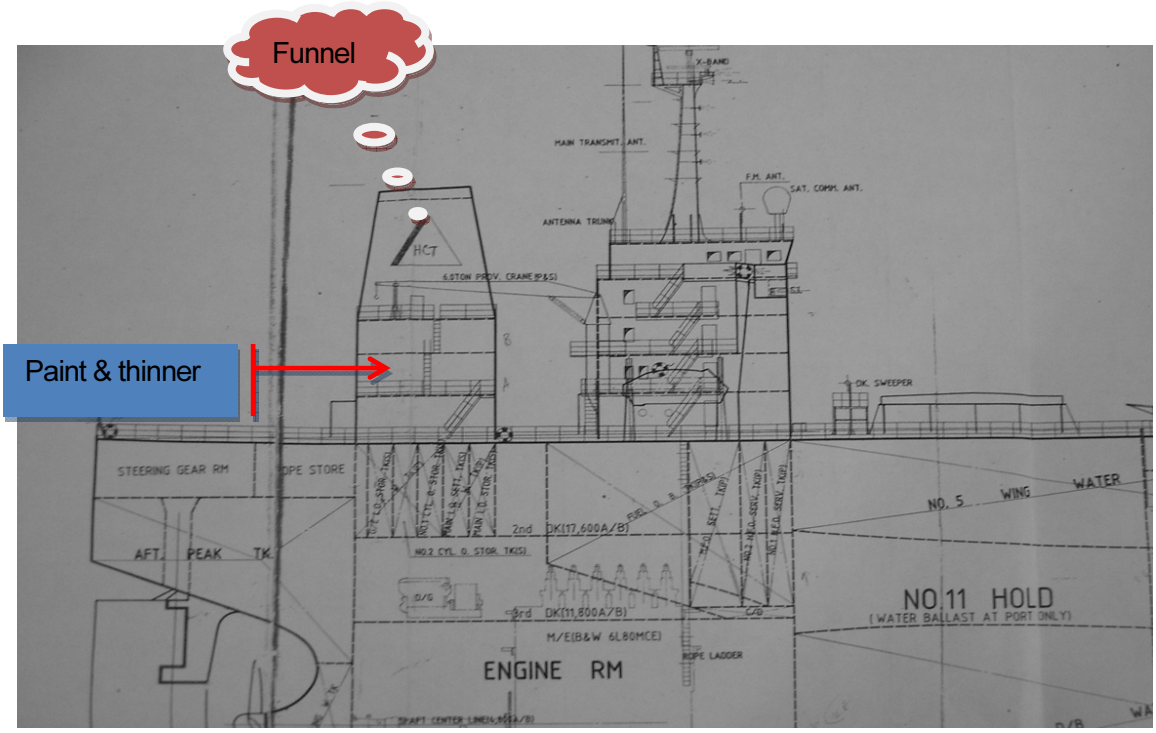


Figure 2 The stored position of paints and thinner

In addition, 3.2m from the upper deck were the boat deck and a deck (referred to as Funnel “A”) of the same height to the left and the right side of the funnel. There was a captain’s deck which was 5.2m from the deck (Funnel “A”) and another deck (referred to as Funnel “B”) in the same height attached to the funnel. A provision crane and a boom post were located on the upper Funnel “B” deck.

Since the deck, which was connected to the funnel, was separated from the crew space and the stairs were used to get there, the crew and anyone else were not easily able to approach this area. The area was rarely used, and was only used when performing jobs related to the crane or the funnel.

Imperfect combustion materials, such as soot or ash, generated from the boiler or the main/auxiliary engines in the engine room while navigating or mooring were blown from the funnel of the vessel. Occasionally, sparks were discharged, together with soot or ash, within the imperfect combustion materials and stacked on the deck floor or around the funnel.

There were 2 pendant lights (220volts-60wats) on each of the decks (“A” and “B”) around the funnel, about 2.60m from the floor (the deck “A”) and about 2.45m from the floor (the deck “B”) respectively. The lights were on when the vessel was anchoring at night or laid alongside a pier.

There were a total of 18 crew members aboard when leaving the port of PDA in Brazil, carrying 197,000 tons of iron ore. The vessel entered the port of Gwangyang, Junranamdo, Korea, at

around 09:15 on 25th April 2007, and began loading and unloading using the ground cargo gear immediately after arriving at the raw material port no.2.

While unloading, from around 09:00 to 17:00 on 27th April 2007, Captain who was involved in the accident, loaded paints and thinners from a ship's stores carrier in order to use them for repairs of the vessel by dry docking in a Chinese shipyard when she arrived at China after leaving the port of Gwangyang, in early May.

The company's safe management manual (ISM manual) sets out clearly that hazardous or inflammable materials including paints and thinners should be stored in the paint locker located in the bow of the vessel. However, Captain ordered the First Mate and the other crew to store the paints (aqua paints - 24,440kg, Kcc paint - 128 cans) and thinners (3,186 litres) wrapped in plastic material on the funnels "A" and "B" locating in the stern area by using a provision crane equipped only for the ship's stores, because there was not enough space for them elsewhere and they could interfere with the ship's work. However, both funnels "A" and "B" were under a high risk of fire with the soot and sparks flying around the area

Captain advised them to bundle the paints and thinners with pallets made of timber and to stack them into 2 layers, around 2m high, on each of the decks. However, he failed to inspect thoroughly for any damage on the containers of paints and thinners at the time of loading them, as there were about 1,000 containers altogether. In addition, they did not comply with the necessary safe measures such as preventing fire in the area/surroundings or strengthening inspection rounds of the area when covering them with vinyl.

Completing loading the paints and thinners, Captain was negligent of the inspection rounds of the loading area while discharging their cargo. So, Captain was not aware that the paints and thinners were leaking from damaged containers, and that soot and sparks were falling from the funnel onto the paints and thinners.

At around 22:20, a Myanmarese crew was passing by the stern and observed a fire in the area where the paints were stored. He immediately shouted "fire" and reported it to Second Mate who was on duty and was balancing water at the ship's office and ballast water control room located on the upper deck, and First Mate who was in his cabin. First Mate consequently checked the accident site, and immediately pressed the emergency bell to activate the fire alarm in order to inform all crew of the fire on the vessel.

At the time of the accident, it was clear and a north westerly wind was blowing at 6-8m with calm waves of only 0.5m in height.

Captain was in the captain's room when he heard the emergency bell and First Mate reported the accident to him via walkie-talkie. Captain immediately ordered him to "announce it through the public address system", then he went up to the bridge where he affirmed the area on fire was where the paints and thinners were located. As the wind was blowing from the stern, flames and fumes were being carried to the bridge. Captain ordered all the crew and others in the accommodation areas to evacuate to the starboard side of the vessel. Then he went down to the area. The fire fighting team was composed of the ship's crew already and they were fighting the fire by using fire extinguishers and the fire hose.
About an hour after the crew began to fight the fire, fire fighters from land arrived and put out the fire completely at around 23:30 on the same day.

As a result of the accident, all paints and thinners located in the accident area were ruined. In addition, various electrical facilities (panel, board, fan motor, etc.) in the emergency generator room which was close to the accident area, and ship's stores placed around the area were damaged. The funnel wall and decks were severely damaged and ruined with smoke.

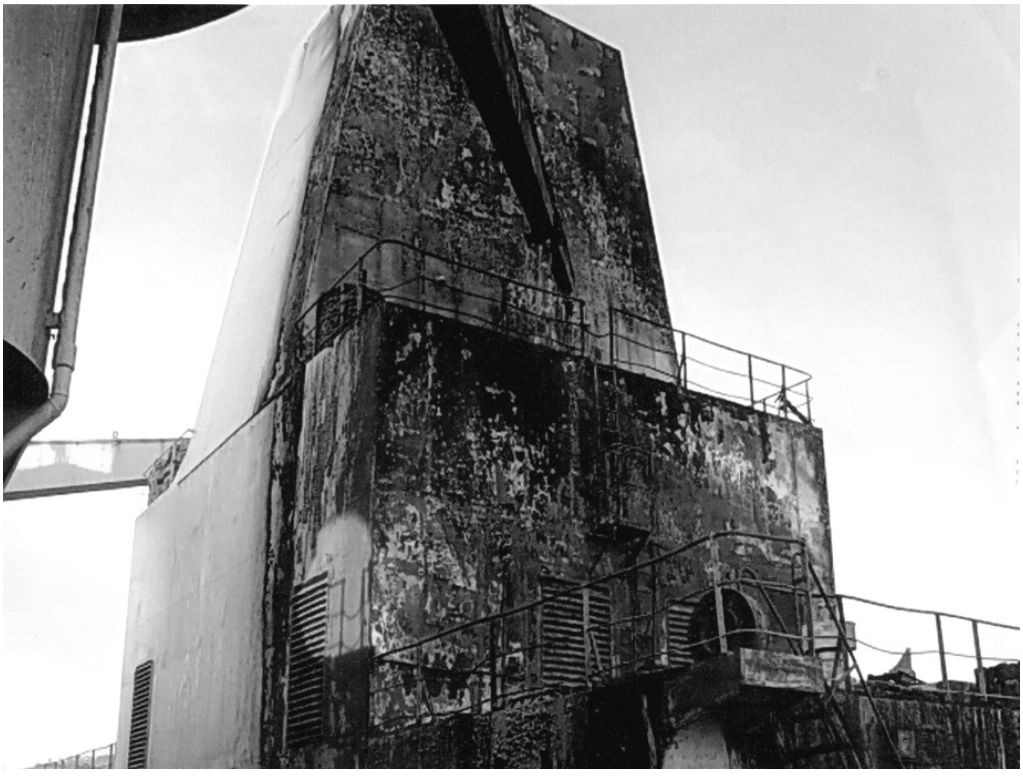


Figure 3 After the fire

3. Causes

3.1 Consideration regarding the place where the fire started

3.1.1 The risk

The fire started on the deck connected to the funnel, from which imperfect combustion materials such as soot and/or sparks generated from the boiler or engines occasionally flew onto the decks. Even at the upper deck, which was about 18.20m below the funnel entrance, was observed having these combustion materials on it. Heat was coming from the external lights on the wall of the funnel, and the funnel itself was at the highest temperature in the ship, as the exhausts passed through the funnel. As such, no flammable materials are allowed to be around the funnel.

3.1.2 Accessibility

The accident area was warm as the surrounding temperature was high due to the funnel and combustion materials such as soot or sparks from the boiler or engines were occasionally flying in that area. Therefore, the crew and others rarely accessed the area. In addition, the decks separated from the accommodation area had limited accessibility to this area. It was also inconvenient to use the stairs to get to this are of the ship. Accordingly, the area was used only when a repair was being done on a funnel and around it, or when repairing a boom post of a provision crane.

3.2 Loading paints and consideration about safety measures

3.2.1 Loading paints or thinners

Paints or thinners are very flammable dangerous materials and they are not allowed to have contact or exposure to any heat of fire. The ship management company also set out paints and thinners as “normal hazardous” materials and when they are loaded in a paint store, they are brought to the designated area in accordance with the safety management procedures. However, the captain failed to comply with this rule, and loaded the paints and thinners into an unsafe area that had a risk of fire. His only considerations were that there was not enough storage area for them, that they may interfere with the vessel’s designated work, and that it would be easy to access them when needed to use for repairing the vessel.

3.2.2 Neglecting the safety management

The paints and thinners stored in the fire accident area failed to be inspected thoroughly as to whether there was any damage on the 1,000 containers before or after loading them. The captain was not aware of the leaking materials from the damaged containers while they were being loaded. Plus, he did not enhance the duty rounds in that area and he also failed to cover the loaded materials with any waterproof materials or asbestos to protect them. Only vinyl was used to cover the tops of these materials, creating a risk of fire when high heat or sparks came into contact with the vinyl.

3.3 The events that set the fire

The paints and thinners were loaded to about 2m in height. There were bulbs of 220v-60w within just 40-60cm of the height of the paints and thinners, which discharged heat, and high heat came into the area from the funnel wall. All of these factors are assumed to have caused the fire, as soot and sparks flew in from the funnel and contacted the strongly flammable gas leaking from the paints and thinners.

3.4 Cause of the accident

The fire accident occurred due to not complying with Safety Management Rules. Paints and thinners create a high possibility of fire and as such, should be loaded and stored in a designated area. Captain loaded them onto the decks surrounding the funnel, where high heat and flames exist, and he neglected the safe management of these materials. As a result, sparks flew in from the funnel and made contact with the combustible gas created from the paints and thinners, and with the vinyl on top of them, which all led ultimately to the fire being set.

4. Lessons from the accident

A. Paints and thinners should be dealt with in accordance with the related regulations for safe handling and/or storing.

B. When moving, loading, or keeping a hazardous material, any damage or leakage on a container should be checked cautiously and rounding in the area should be enhanced.

（大韓民国）

The submersion of the general cargo vessel Orchid Sun

Korean Maritime Safety Tribunal

CONTENTS

Figure

Summary

A cargo vessel, the Orchid Sun (26,046gt) at an age of 22, left the port of Xingang, China, carrying 42,040.8 tons of iron ore, headed for the port of Khomeini, Iran. While on course, she was attacked on the port side of the bow by strong winds and waves, resulting in ingress of ocean water. Subsequently, the ship sank at about 107 miles east from Masqt, Oman, at around 03:22 on July 12th, 2007, with 13 of its 23 crew members deemed dead or missing.

1. Facts

1.1 Vessel details

Name of Vessel	Orchid Sun
Port of Resgistry	Jeju, Korea
Shipowner	KDB Capital
Gross Tonnage	26,046.00
Built	December 1985
Classification Society	Korean Register
Construction	Steel
Length Overall	185.84 M
Engine power	7,120 KW
Person on board	21persons

1.2 Accident Details

Time and date of accident	0322 (UTC+4), 12 July 2007
Location of accident	23°52'06"N-060°40'54"
	(about 107 miles from the lighthouse in Masqt, Oman)

1.3 General cargo Orchid Sun

The steel general cargo vessel Orchid Sun was 26,046gt, 177.97m in length (a total length of 185.84m), 30.40m in width and 16.20m in depth, and powered by one 7,120kw diesel engine.

She was built in the Hashihama shipyard in Japan in December 1985 and launched shortly after its completion. Since that time, her name and registry changed several times to various countries. She was registered in Jeju, Korea on June 23, 2005 by SWU Shipping ("The Company SWU Shipping" hereafter). The Company SWU Shipping bought the ship from Valleta in the Republic of Malta, by means of money leased from KDB Capital and changed her name from 'Sety' to 'Orchid Sun'.

As shown in [Fig. 1], the ship's wheel bridge was located in the stern, was divided by an FPT(fore peak tank), cargo hold areas (nos.1~5), an engine room, and an APT(after peak tank) in the bottom part of the upper deck. There was an accommodation area and a wheel house over the engine room. With a cantilever type body, there was a double bottom tank which was used for storing the cargo oil or ballast water in the bottom part of the cargo hold areas, while the topside tanks were located on each side of the upper area.

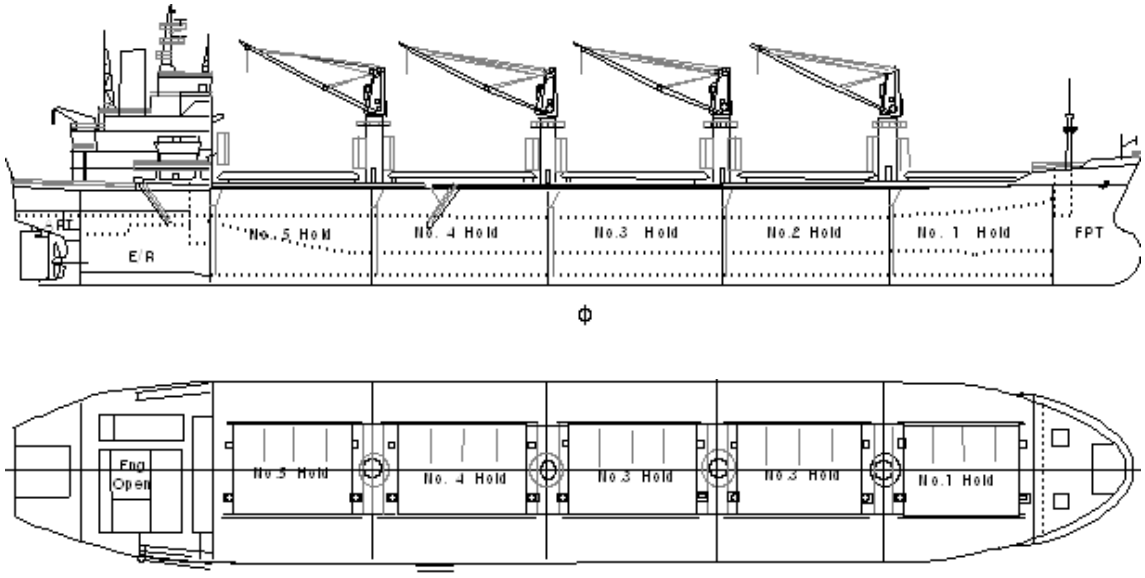
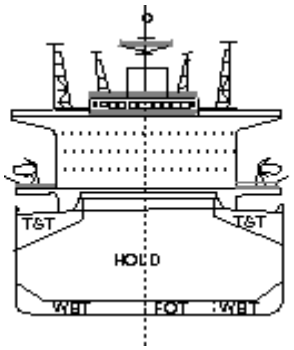


Figure 1 General Arrangement



Since the ship was built, she had been holding a shipping class given to it from the Japanese Register of Shipping, but was eventually registered in Korea after passing a classification survey after construction from the Korean Register of Shipping in Kosichang of Thai, on April 20th, 2005.
In the process of the classification survey after construction, Taeyang Industry LTD. was in charge of measuring the thickness of the plates for the outside and overall body of the ship, from April 19th, 2005 to April 20th, and did not report any particular problems. They did not measure the thickness of some of the plates such as all wind and water strakes between the ballast load line and the load line, as those were supposed to be measured in the 4th periodical survey, under the classification rule.

The ship received an annual survey from June 3rd, 2007 to the 5th at the port of Pohang. At the time, the surveyors from the Korean Register of Shipping conducted a compartment survey for the status of all cargo holds, including the close examination of the cargo hold areas nos. 1, 3, and 5. The painting status was reported to be not very good, as a few corrosions were observed, but no further particular problem were discovered at the time.

At the annual survey, the ship was ordered to fix the corrosions on the scupper drain pipes in the dining room and the wheel house, as well as the leaking valves discovered no later than August 30th, 2007. Thus, the drain pipes and valves were fixed on the 15th of the month, and the ship passed the survey conducted at the port of Tianjin China.

As of the 15th of the month, no inspection was reported missing or late. Regarding further inspections, a docking survey and an auxiliary boiler inspection were expected to be done on March 20th, 2008, and an intermediate survey was scheduled for April 29th, respectively.

The Company SWU Shipping hired 21 crew members consisting of Koreans and Filipinos, through Geomarine LTD., a crew management company, and delivered the cement, pet-coke, scrap, iron ore, etc, from a worldwide tramper for the ship. In the meantime, there had never been a marine accident or a flooding accident in the cargo hold areas. Any substantial faults had never been pointed out at any Delivery/Redelivery Survey or by the PSC (port state control) survey.

The Company SWU Shipping gave the ship to Korea Shipping LTD., as a part of a time charter around May 2006. Then, the Korea Shipping LTD., a charter company, gave the ship to STX Pan Ocean LTD., as a part of a time charter around March 30th, 2007. The ship was then supposedly sold to a shipping company in Chile when two Chile crew members sent from the buyer, boarded the ship at the port of Singapore on June 28th, 2007.

The ship entered the port of Xingang, Tianjin, China around 05:18 (local time, hereafter) on June 10th, 2007, with 21 crew members consisting of 8 Koreans and 13 Filipinos on board. They loaded 42,040.8 kilo tons (20,857 bundles) of iron, including iron reinforcing rods and wire rods and stored them separately in each cargo hold area. Namely, 7,702.8 tons in the cargo hold area no.1, 8,370.4 tons in the cargo hold area no.2, 8,957.0 tons in the cargo hold area no.3, 9,101.6 tons in the cargo hold area no.4, and 7,909.0 tons in the cargo hold area no.5, brought on board starting around 21:30 on 12th, finishing around 23:15 on the 17th of the month.

They first put wooden square bars on the floor of the cargo hold area, and then loaded the iron reinforcing rods. The wire rods were loaded from one side to the other so they could not move on top of the iron reinforcing rods. After the loading was complete, a person from a service company from the land embarked on the ship and secured the top tier of the cargo using steel bands around 00:15 on 18th of the month. Then, First Mate and a marine surveyor from Roy Appraisers & Surveyors Ltd. entered the cargo hold areas and ensured the cargo was secured.

While loading the cargo, the marine surveyor continually inspected the status and stowage of the cargo to ensure storage areas were secured. No damage on the body was reported.

The ship left Xingang, China, carrying 42,040.8 tons of iron ore, 418.6 tons of fuel oil, 160 tons of fresh water, and about 150 tons of dead ballast, and headed for the port of Bandar Imman Khomeini, Iran. She was 11.13m forward draft and 11.33m aft draft.

The minimum crew for the ship was 14. Upon leaving port, there were a total of 21 crew members consisting of the captain, 3 deck officers, 4 engineer officers and 13 rating crew. All crew members including the captain held marine officers licenses in accordance with their job descriptions. In particular, Captain started his career as a Third Mate on the Oceanbanner of Pan Ocean Shipping Co., Ltd.on April 23rd, 1993, and was then promoted to Second Mate and First Mate to a general cargo vessel. He started as First Mate to the ship on September 6th, 2006, and finally became its captain on December 27th of that year.

While navigating to the port of Bandar Imman Khomeini, Iran, the ship entered the outer harbor of Singapore around 01:36 on the 28th of the month, to get 1,069.9 tons of fuel oil, 30.1 tons of diesel oil, and 150.0 tons of fresh water, under the command of the captain. The 2 Chile crew members added by the buyer embarked there.

The ship left the port of Singapore, carrying 42,040.8 tons of iron ore, 1,270.8 tons of fuel oil, 186 tons of fresh water, and about 150 tons of dead ballast water at around 10:00 that day. She navigated to its intended course at a speed of 11knots, and altered its true course to about 304° at the west entrance of the traffic separation line located to the south of Sriranka, the following month, at around 18:00 on July 3rd. She set a true course of about 317° toward the entrance of the Strait of Oman when arriving in front of the Cape of Comorin located to the south of India, and then proceeded to navigate between the main land of India and the Laccadive Islands.

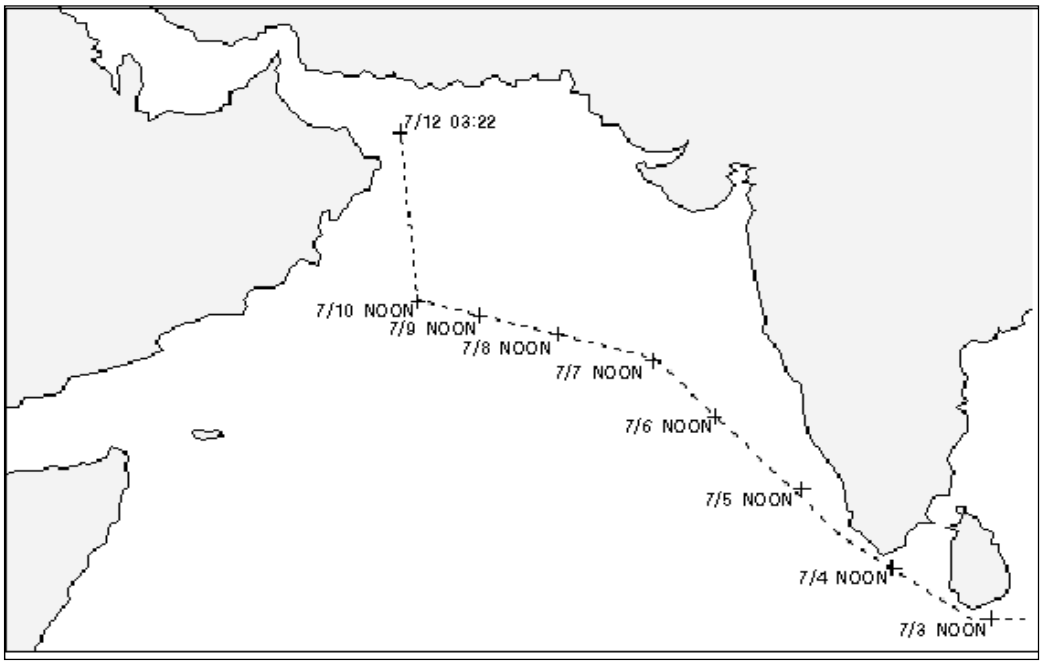


Figure 2 Ship's trace by the Noon report

In the meantime, the weather had worsened. From the 6th of the month, a westerly wind was blowing at about 14~17m/s and the waves were 4~5m high. The ship was attacked by strong winds and waves at a 30 degree direction to the port side of the bow, resulting in severely shaking the body. An RPM of the main engine decreased by 4-5 revolutions and the ship's speed was reduced to 8~9 knots of ground speed. The First Mate stopped the sounding of the hold bilge, which had been started by a quartermaster on-duty every morning.

The ship altered its course to about 280° of its true course around 15°06'00''N-069°04'00''E, and began deviating at around 12:00 on the 7th as a westerly wind of 14~17m/s changed to a southwesterly wind of 17~21m/s and the waves grew to 5~7m. They deliberately did not reduce the speed of the ship when deviating from their true course.

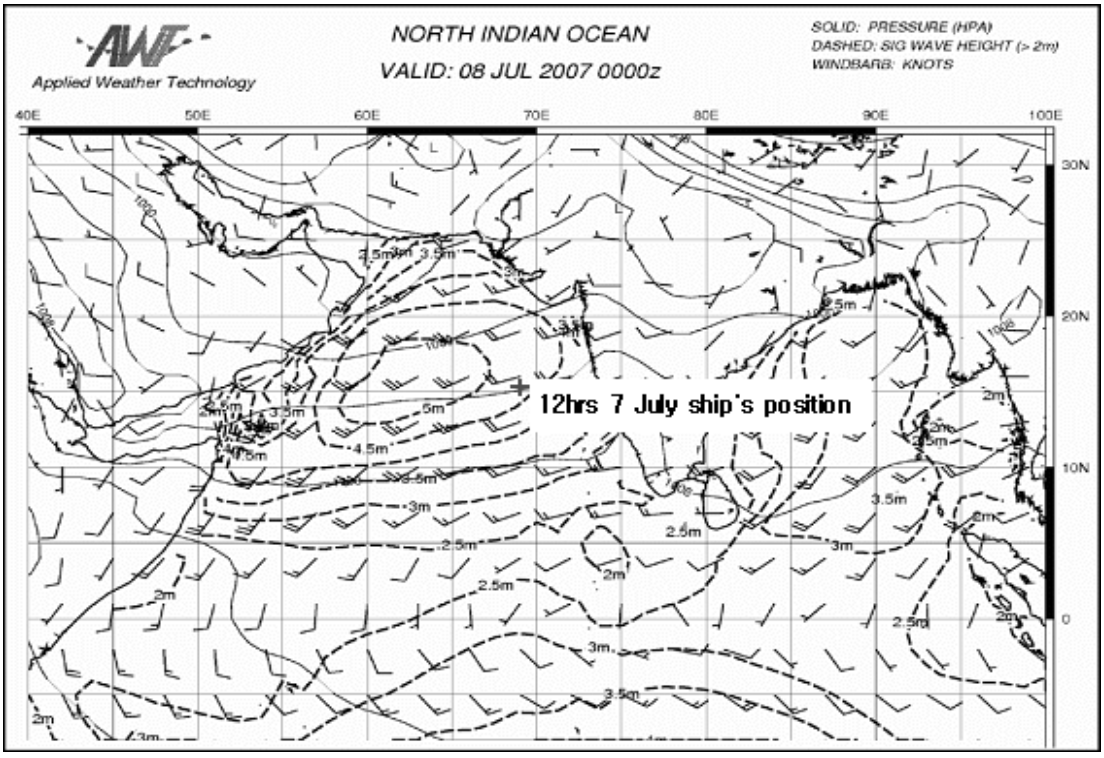


Figure 3 Weather chart 0400hrs 7 July 2007

The ship was shaken seriously by the strong winds and waves at about a 60 degree direction of the portside of the bow. The ship crossed the Arabian Sea at about 6.5 knots around 22:00 (UTC+4 as local time, hereafter) on the 9th of the month when the Third Engineer on-duty , discovered ocean water pouring into the coupling of the bilge line located in cargo hold area no.1, which opened into the wheel house. Third Engineer reported this to Chief Engineer, and according to the order given by the Chief Engineer, immediately assembled the bilge line to discharge it from the cargo hold area. The main bilge line of the ship was 199.9mm in radius and the sub lines were

102.3mm in diameter. There was a Check Valve located on the bilge line which was connected to the cargo hold area in order to prevent a backdraft.

Captain was informed of the flooding in cargo hold area no.1. Assuming that it was just a usual leak caused by severe sea conditions the captain kept navigating the ship forward without any treatment, resulting in the bilge from cargo hold area no.1 to be discharged through the bilge pump.

Second Mate handed over navigational watch to Third Mate following day, around 00:00, when he was ordered to keep watch on the status of the water ingress detection system, as the bilge of the cargo hold was discharged through the bilge pump, which resulted in the flooding of cargo hold area no.1. He identified through the water ingress detection system that the cargo hold area was flooded to about 5m, and reported this fact when handing over his navigational watch to First Mate at around 04:00 that day.

On the other hand, First Mate went up to the wheel house to hand over navigational watch at around 04:00, and was informed by the on-duty Second Mate that the water ingress detection system began running while he was on duty. At around 06:00, First Mate read graphs showing that the cargo hold area no.1 was flooded to about 5m. The Quartermaster on duty told him there was an occasional malfunction with the system. First Mate did not immediately check on the status of the flooding. In fact, he had never seen any malfunction of the system since he had served on board the ship. Yet, there was no sign of flooding, such as listing of the body at an opposite degree, and he depended on what the quartermaster reported to him.

Captain went up to the wheel house at around 07:10, and told First Mate that the bilge was filling up in cargo hold area no.1 so that they had been discharging the water since the night before. However, both Captain and First Mate did not recognize the severity of the situation. They were concerned that the crew may be tired from manual steering and that it would be dangerous for any crew member to venture out on deck under the weather conditions and high waves. Therefore, they continued to maintain the pumping through the bilge pump while navigating on course until after lunch time.

At around 12:00, Captain reported that the water ingress detection system was on because the flood in cargo hold area no.1 was detected. This was deemed to be caused by leaking water from the severe sea conditions. This was reported to the designated person of Company SWU Shipping, over the phone. DP ordered the captain to figure out and report back detailed information, including the cause of the water leak, the area where the water was leaking in, and the amount of leaking water.

Captain set a true course of about 030° so that the stern side would face the strong winds and waves at around 12:20, and entered cargo hold area no.1 to check with the crew, including First

Mate on the status of the flooding. At that time, the ocean water was up to 7~8m from the floor in the cargo hold area. Over the height of the cargo loaded, there was no flooding observed. They confirmed that there had been no cargo moving through the canvas which was sparsely covered, but they failed to locate the exact location of where the leak was in the storage area.

While Captain left for the ship's office to check on the ship's seaworthiness, First Mate and other the crew members confirmed that there was no flooding in the other storage areas, located behind cargo hold area no.1.

Captain and a Chile crew member calculated the estimated draft, trim, stability, longitudinal strength, and others, using a load-master in the office, and they concluded that the ship would not sink or capsize even if cargo hold area no.1 completely flooded.

The ship changed course, setting a true course of about 350° to minimize the impact of strong winds and waves, and navigated to the north at about 9 knots. They checked the amount of flooding in the cargo hold area no.1 every 30 minutes, but failed to close the entrances and the watertight doors on the upper part of the deck. As time went by, the flooding in the cargo hold area no.1 increased, and the gage on the water ingress detection system closed to 12.9m at the First-night watch (20:00~24:00) of the day. From then on, no further increase was indicated, maintaining the same water level.

Captain, while navigating to the north at about 10 knots, at a true course of 350°, reported to Company SWU Shipping the flooding report as shown in [Table 1] on the following day, the 11th, at around 12:25.

SOUNDING REPORT								Status	
No. 1 Hold	FPT	No.1 DBT		No.2 DBT		No.2 Hold		Course	350°
		P	S	P	S	P	S	Speed	10knts
12.90m	0.28m	0.05m	0.13m	0.02m	0.03m	0.63m	0.65m	sea status/wind	6/5

[Table 1] Flooding report (1225 hrs 11th July)

Later, the strong winds weakened to a fresh breeze, and waves calmed too. But, at around 18:05, the gage of the ingress water detection system in cargo hold area no.1 began to rise again, indicating the flooding had increased. Consequently, the bow began to sink which was very serious, as the forepeak tank and the ballast water tank no.1 were no longer available for sounding.

SOUNDING REPORT								Status	
No. 1 Hold	FPT	No.1 DBT		No.2 DBT		No.2 Hold		Course	350°
		P	S	P	S	P	S	Speed	10knts
13.50m	N/A	N/A	N/A	0.02m	0.03m	0.63m	0.65m	sea status/wind	5/5

[Table 2] Flooding report (1805 hrs 11th July)

Meanwhile, the ship continued navigating to the north at a true course of about 350° and at a speed of about 10knots. Second Mate went up to the wheel house for his navigational watch the following day, at around 00:00 on the 12th, when he noticed the bow had dropped further, that cargo hold area no.2 was sinking beneath the surface of the water, and that the propulsion machinery was at zero rpm. He reported his findings to Captain.

Captain went up to the wheel house and checked on the flooding water and the ship's position. Then, he set course at a true course of 270° to navigate directly to Oman, which was about 90 miles away from there. However, due to a large swell, pitching was too hard, so the course was reset to a true course of 000°.

Captain called all crew members to the wheel house at around 02:40 as the ship was listing on the port side at 2-3 degrees and the stern side was rising preventing the steering key from being available to use. The crew stood at the wheel house wearing life jackets while the captain went down to his office where the satellite telephone was locating, in order to call Company SWU Shipping.

At around 02:45, First Mate suggested that they leave the ship, but Captain told him to stay longer until the salvage boat was ready, and ordered lifeboats lower to the boat deck at around 03:15.

As crew members were lowering the lifeboats to the boat deck, the ship, still navigating to north at a speed reduced to about 3 knots due to excessive dropping, lost its balance a couple of times followed by an excessive noise like 'pa-pang', and eventually sank from the bow, at a position of about 082° from its true course, about 107 miles from the lighthouse of Masqt, Oman, at around 03:22.

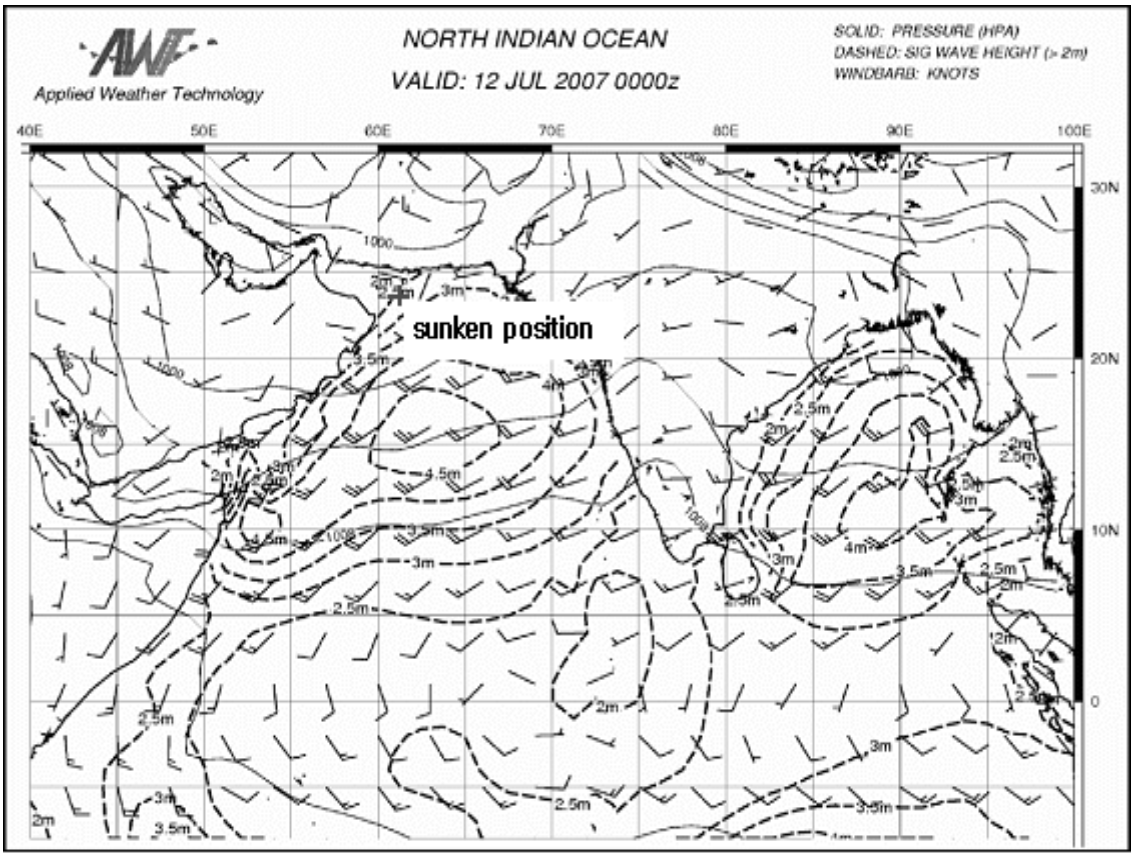


Figure 4 the sunken position of the ship

At the time of the accident, it was clear and a southwesterly wind was blowing at about 7-10 m/s, resulting in calm waves of only 0.5m in height or so.

The crew wearing lifejackets at the wheel house, on the boat deck, and in their cabins, fell into the ocean as the ship sank. 10 of its 23 crew members, including 4 Koreans, 4 Filipinos, and 2 Chileans were rescued by other vessels who were navigating in the area including the Bahama-registered cement carrier called the MegahCement and by an Indian registered LPG tanker called the M.T. MaharshiKrishnatre.

Captain from the MegahCement was about 18 miles away from where the Orchid Sun was sinking when he received a distress signal from the Orchid Sun. He immediately changed course and headed in the Orchid Sun's direction. Arriving at the accident site, captain rescued 7 crew members from the ocean, including Second Mate, and then reported the situation to the other vessels around the area, including the nearest Salvage Association.

Later, another 5 vessels from the area, warships from Sultanate of Oman, Japan, and U.S., and 3 salvage helicopters searched for the missing crew. 1 of the 13 missing crew was found dead, while the remaining 12 were reported missing.

The crew rescued person entered the port of Masqt at around 03:50 of that month aboard the naval warship of Sultanate of Oman, and returned to his home country after completing a physical test. First Mate and Second Mate, Second Engineer Norman, and Engineer were injured while being rescued, so they were treated either in the local hospital or in Korea.

The Company SWU Shipping owned and serviced 2 vessels, namely the Orchid Sun involved in the accident and the Orchid SunSky, a general cargo vessel (26,014gt). The company had established a safety management system in accordance with the related rules of the Marine Transport Safety Act, and received a DOC(Document of compliance for safety management system) from the Korean Register of Shipping on February 6th, 2003.

In accordance with the vessel management procedures which the Company SWU Shipping prepared and enforced, First Mate regularly examined the plates of the body with his eye, but nothing particular was ever reported. Plus, the responsible safety manager from the company and surveyor visited the ship at Tianjin, China, between September 3rd, 2005 and 4th, at Incheon, Korea between December 26th, 2006 and 31st, and at Pohang, Korea, between June 3rd, 2007 and 5th, respectively. No major non-conformities were discovered, yet they did point out that the shipboard maintenance (painting work) was required as early corrosion was already noticeable.

The ship management procedures of the company were as follows: (1) under severe sea conditions, the captain is to be ready for the severe conditions by closing the watertight door and hatch in advance of the severe weather, checking the safety of the berth/mooring facilities, opening the drain holes and securing all portable objects and fittings; (2) Other than urgently required work that affected the safety of the ship, nothing should be attempted on the exposed deck; (3) Careful monitoring of the accommodation area is required in case of any abnormal circumstance; and (4) Appropriate steering should be applied under the weather conditions, and if needed, returning to port should be thoroughly considered.

In addition, Company SWU Shipping identified and set out possible emergency situations on the ship. They reinforced all accident preventing solutions, and through education and training, under real situations, let the crew learn how to actively respond to an emergency situation, so as to minimize damage and accidents from becoming worse. Further, the company established emergency response procedures by inspecting the cause of accidents and analyzing them, in order to prevent similar accidents from occurring.

According to the emergency response procedures of the company: Captain (1) should be striving to stop the spreading of the accident and to keep the seaworthiness of the ship; (2) should judge the overall situation based on the related information, and should immediately address the situation, i.e. changing course, stopping the main engine, organizing the emergency response on the ship, etc.; (3) should report and request support from land as quickly as possible; (4) should try to keep

related documentation when leaving the ship, as well as to do his best to prevent any pollution; and (5) should carefully review the salvage contract with the company, including discussing such in advance, etc. In addition, when flooding occurs, the following are also required: (1) visual examination of all accessible structures; (2) measuring all tanks and cargo holds; (3) sound of all locations making contact with the water surface; (4) estimation of damages by checking the draft, trim, and list(slope); (5) maintenance of the balance of the ship by discharging ballast water, transferring fuel oil, dropping or transferring cargo when the ship begins to list; (6) review of any requirement for external support or towing to the nearest port of refuge or to a repair port; (7) preparation of towing or transferring cargo(lightering); and (8) appropriate response such as abandoning ship or giving a distress signal when safety for the crew is in question. Plus, the company, if needed, has structured an emergency service organization, the responsible for the safety management procedures to minimize the damage to human life, the ship and cargo, in view of the severity, range of the accident and the impact to the company by the accident.

The Safety Management Person, DP of the company received the report from Captain at around 17:00 (Korean standard time, hereafter) on July 10th, 2007, that the ingress water detection system had been turned on due to flooding in the cargo hold area no.1, due to water leakage resulting from severe sea conditions over a long period of time. DP immediately reported the same to the CEO of the company. Then, CEO told him to identify and report more accurate information on the cause of the leakage, the starting location of the leakage, amounts, etc., before leaving the office for the day.

On the following day, the 11th, at around 09:00, CEO of Company SWU Shipping was informed by DP, the safety manager, that there was a lot of flooding in the cargo hold area no.1, from an unknown reason and as such that they were discharging the water through the bilge pump. He was also informed that there was no flooding reported in the forepeak tank connected to the cargo hold area of no.1, the cargo hold area no.2, the ballast water tank located in the lower part of the cargo hold area of no.1, and others.

Accordingly, Company SWU Shipping organized and reinforced the emergency response center. Meanwhile, CEO received a report directly from Captain that there was no problem on seaworthiness and that the flooding area was limited only to cargo hold area no.1. Therefore, they deemed the situation was not very serious.

They thought that there may be already damage on the body of the ship, and thus they made the decision to return to the nearest port, either Dubai or Fujayrha, for temporary repairs. They contacted a rescuing company to discuss the rescue support measures, such as availability of an emergency service or tugboat. At the same time, they reported the accident to the Korean Register of Shipping and the insurance company of the ship, requesting an occasional survey, as well as designated a local agency, and then discussed the temporary repairs and emergency supports.

The company ordered Captain: (1) to check the operational status of the bilge pump in the cargo hold area, to survey carefully the increasing flooding amounts, in particular if there was any way of transferring the water to other tanks near the cargo hold area ;(2) to examine the situation of the flooding of cargo hold area no.1; (3) to make all crew stand by for any emergency situation so as to keep the safety of the crew a priority; (4) to check the bilge of the cargo hold, fuel oil, and ballast water ;(5) to check the changes on draft, trim, or slope; (6) to report the availability of navigating to the nearest port for repairs; (7) to check and prepare in advance for abandoning the ship; (8) to check the status of the cargo in the other cargo hold areas and the change of trim; and (9) to report to the company in case of distress and to request for rescue from the nearest countries, and for this, to check the emergency signal and contact system, etc.

In addition, the captain was told (1) to report their course, speed, weather and sea conditions, the flooding status of the cargo hold area no.1, the status of the bilge and ballast water connected to cargo hold area no.1, expectant time to enter the port of Dubai, etc., every 2 hours, and (2) to check the status of the ship every hour, and to enter the nearest port in case navigation became impossible.

In particular, Captain asserted that the ship would be able to self-navigate when communicating over the phone around 15:00 on that day. The company however, ordered him to be ready for an emergency situation and abandoning the ship in the worst case scenerio.

On the following day, the 12th, at around 08:00, Company SWU Shipping reported the flooding accident of the Orchid Sun to the Ministry of Maritime Affairs and Fisheries as the situation worsened beyond their expectations. Minutes later, at around 08:22, the National Marine Police Agency identified the distress signal from the satellite EPIRB (Emergency Position Indicating radio beacon) of the Orchid Sun.

2. Causes

The submersion accident is applied under the 2nd rule, Article 1, (A), (B), and (D) of the [Inspection and judgment of marine accident law].

2.1 Consideration of the cause

2.1.1 Consideration of the physical situation in light of the submersion

On the Orchid Sun, about 53 hours before the submersion, lots of ocean water was ingressing into cargo hold area no.1 for unknown reasons. As flooding amounts increased, the bow part dropped, causing the ship to sink.

A) Cause of submersion

(1) Status of the body

The plating of cargo hold area no.1 were made of steel plates in 12~20mm thick. About 2 years before the accident, in April 2005, when the plating thickness was measured at Kosichang, the wear was within a range that was permissible. At a compartment survey received at the port of Pohang a month before the accident, the ship was reported to be generally in fine condition, except for a need for painting its body. Still, considering that the ship was built in 1985 and launched, there could be many hidden defects possible in such an old ship. Besides, some plating areas between the ballast draft line and the draft line were not measured for their thickness in April 2005.

(2) The progress of navigation

The ship was navigating at a speed of 6.5~10 knots while being attacked at the port side of the bow by strong winds and waves starting around July 6th, 2007. Accordingly, there was a possibility of damage on the plating areas such as cracking around the welding connection areas from the strong wind and wave impacts. Other than that, there were no particular events that would have caused damage on the plating area of cargo hold area no.1.

(3) The possibility of flooding through the bilge line

There was deemed no possibility of flooding through the bilge line as the bilge line of cargo hold area no.1 was open within the engine room before discovering the flooding. Plus the following facts supported this conclusion: (1) There were check valves in the bilge lines connected to each cargo hold area in order to prevent back drafting of the ocean water; (2) From dawn on July 9th to 12:00 that day, flooding increased only 2m of where the cargo was loaded. But, from 12:00 to the first night watch on that day, the flooding increased to about 6m. Therefore, the flooding amount per hour had increased quickly; and (3) if the ocean water back drafted through the bilge lines, the flooding amount would have increased more rapidly. But this was not the case, as the flood amount remained the same from the first night watch on the 10th to around 18:05 on the 11th.

B) The starting point of the flood

(1)The structure of the vessel

Around the cargo hold area no.1 where the flood occurred, there was a forepeak tank, cargo hold area no.2, and a double bottom tank which was used for the ballast water tank in the lower part. Also, the topside tank was located in the upper part of each port side and starboard side, while the hopper side tank was standing high up within the lower part. As such many areas surrounded

cargo hold area no.1, where the single skin, the only part contacting the ocean in the cargo hold area, from the side shell plate, was located only between the hopper side tanks and top side tanks

(2)Checking by the crew

The crew identified the flood in the cargo hold area no.1 and checked inside, but did not recognize the flood area directly, as there was no flood over the top of the stacked cargo which was about 7m high. The other compartments surrounding the cargo hold area no.1, such as the forepeak tank, the ballast water tank no.1, the cargo hold area no.2, and others were reported to be fine.

(3)Estimated flooding area

The flood area was deemed to be between 7m high from the floor and somewhere between the ballast water tank no.1 and the hopper side tank in cargo hold area no.1.

C) The possibility of submersion due to the flooding of cargo hold area no.1
The following was calculated by the Korea Classification Society, after the accident, considering the fact that the cargo hold area no.1 was completely flooded. Such results concerning stability, draft or longitudinal strength were deemed to have made no difference from what they calculated in the ship before the accident.

(1)Stability

In the case of the cargo hold area no.1 flooding, the maximum righting lever would be about 0.82m, and the range of the righting lever was about 75°. The size under the righting lever curve was about 0.17m radian, which was higher than the standard for each, 0.10m, 20°, and 0.070m radian, respectively.

(2)Draft

In the case of the cargo hold area no.1 flooding, the forward draft would have changed from about 11.25m to about 17.6m, while the aft draft changed from about 11.32m to about 8.40m. Regarding the trim, about 0.07m of the trim by the stern would have changed to 9.20m of the trim by the head.

(3)Longitudinal Strength

The water bending moment is calculated to be less than 60% of the allowable value of 103,000 ton-meter.

(4)Spreading of the flooded area

A bulk carrier should be designed not to sink even when a cargo hold area on the foremost side floods. The subject matter ship also appeared not to sink when the cargo hold area no.1 completely flooded. However, the bow side dropped more than the calculations indicated. As such, the hatch coaming of the cargo hold area no.2 was sinking below the water surface right before submersion. In such a situation, the ship sank with excessive noise.

From this point of view, the other compartments, other than cargo hold area no.1, were also deemed to be flooding just before sinking. But all other compartments around the cargo hold area no.1, except the forepeak tank and the ballast water tank no.1 were confirmed to have no flooding problems.

(5)Review

According to the above calculation, even though the cargo hold area no.1 was completely flooded, there was still enough stability or longitudinal strength. Although the forward hatch coaming of the cargo hold area no.1 was partially sinking under the water surface, the ship was not supposed to sink as long as the entrance to the cargo hold area and the air pipe of the ballast tank remained above the surface of the water.

The calculations had indicated that the entrance of the cargo hold area and the air pipe of the ballast tank would remain above the surface of the water. But if there was any heeling or if the opening of bosun's store or forepeak tank remained opened under high waves, there would be a possibility of further flooding on the ship. Plus, if the welding area was damaged on the plates of cargo hold area no.1, the damage would become greater over time, resulting in flooding into the other compartments.

D) Sub-conclusion

When the strong waves attacked the ship, the impact would have caused damage to the weak parts of the plating on the lower part of cargo hold area no.1, resulting in the flooding of ocean water into the storage area. The bow part severely dropped when additional flood waters occurred in the forepeak tank and/or bosun's store, through the openings which were not closed off tightly. Or the heats on the plates may have extended to the other compartments, which would have caused additional flooding. These were deemed as the causes for the ship sinking.

2.1.2 Review of the crew casualties

A) Occurrence of a dangerous situation

A strong southwesterly monsoon was blowing, and the cargo hold area no.1 flooded in the middle of the Arabian Sea, far from land. Thus, there was a high possibility of risk with respect to the submersion or capsizing of the vessel.

B) Mistake in judging the ship's safety

The ship was deemed not to be sinking even though the cargo hold area no.1 completely flooded. As such, the captain did not immediately order the crew to leave the ship until the ship was sinking fast. Ultimately, all the crew members fell into the ocean when the ship sank.

C) The distress signal

The crew did not request a rescue due to a sudden submersion. The satellite EPIRB in the ship indicated its location. The distress signal immediately informed other vessels in the area of the accident and an LUT on land of the same. Thanks to quick rescuing efforts, 10 of the 23 crew members in distress were rescued.

2.1.3 Analysis of the causing factors

A) Environmental factors

When navigating under a strong southwesterly monsoon blowing into the Arabian Sea, the ship was attacked abeam to port or bow to port by strong winds at a speed of 14~21m and waves of 5-7m high for a week. The weather did get better and the waves calmed down, except for some big swells around the time of the ship's submersion.

B) Crew factors

There were a total of 21 crew members consisting of the captain, 3 deck officers, 4 engineer officers and 13 other crew members. Thus the crew members were more than the minimum manning standard of 14. All crew members, including the captain, held marine officers licenses in accordance with their job descriptions. However, considering the fact that Captain embarked on the ship as First Mate on September 6th, 2006, and then was promoted to captain in only 3 months, as a newly appointed captain, he would have had so-called 'CAN-DO symptoms', so he would have asserted that he could manage any situation, while receiving high respects and responsibilities from the company. The fact that he underestimated the risk of submersion and attempted to keep navigating under such bad weather conditions this 'CAN-DO symptoms' may have been his reasoning.

C) Vessel factors

The Orchid Sun was over 20 years old at the time of the accident. She was built and launched in 1985. The older a ship, the more thorough inspections and maintenance of its facilities and equipments are required. It was true that the ship was damaged on her platings by waves from a wind scale of 7-8 and consequently, her cargo hold area no.1 flooded.

D) Operational guidance factors

(1)Operational procedures under bad weather conditions

Company SWU Shipping set out under its ship procedures that the captain should attempt appropriate conduct of the ship in accordance with the weather conditions when navigating in severe sea conditions, and that if needed, should consider evacuation of the ship.

(2)Emergency response procedure

Company SWU Shipping established and reinforced its emergency response procedures to identify available emergency situations as early as possible in order to prevent them in advance, and to actively respond to minimize any damages in case of an accident. The company set out general things required for emergency response as well as particular emergency situations, such as fire, explosion, collision, grounding, flood, etc. According to these procedures, in case of flooding, the captain needs to perform the followings: (1) visual examination on all accessible structures; (2) measuring all tanks and cargo holds; (3) sound of all locations connecting with the water surface; (4) estimation of damage by checking the draft, trim, and list (slope) of the ship; (5) maintaining the ship's balance by discharging the ballast water, transferring fuel oil, dropping or transferring cargo; (6) reviewing the requirement for external support or towing to the nearest port of refuge or to a repair port; (7) appropriate responses such as abandoning ship or giving the distress signal when safety for the crew is at risk; and (8) conducting other measures in order to minimize marine pollution. Plus the company, if needed, has to structure an emergency service organization under the supervision of the safety management person, to minimize any danger to human life, the ship and cargo, in view of the severity and range of the accident and the impact of the accident to the company.

E) Factors of the Captain's actions

(1)Enforcing unreasonable navigation

The ship was attacked abeam to port or bow to port by strong waves when entering the Arabian Sea. Later, as a southwesterly monsoon wind became severe, the captain changed course from a true course of 317° to set a true course of 280°, but he did not reduce the speed of the ship,

keeping it to over 6.5 knots of grounding speed. In addition, when discovering the flood, the captain only altered course to 350°, maintaining full speed.

Thus, the ship could possibly have been damaged on its plating areas due to the strong impacts to the body while navigating at a full speed under bad weather conditions. In particular, without reducing speed, changing course from 317° to 280° made the bow on the port side receive strong winds and waves at about a 30 degree direction and consequently, the impact would have been worse.

(2)Delay on identifying the flood

The Captain received the report regarding the flood in the cargo hold area no.1 from Chief Engineer, but he considered it to be just usual leakage from hatches or vapors inside the cargo hold due to navigation in severe sea conditions. So, he failed to identify the flood immediately and only checked the situation again 14 hours later. As a result, the response actions were delayed. If he had examined the flood area upon receiving the report and attempted emergency response actions immediately, the result may have been different from what actually happened to the ship.

(3)Mistakes in judging safety

The calculations showed that the ship would not sink even if the cargo hold area no.1 completely flooded. However, there are always errors in calculations and situations can worsen at anytime. But, the captain was over confident on the results of his calculations and did not response actively. As a result, they missed the appropriate time to abandon the ship.

F) Factors on First Mate's actions

In accordance with the emergency response procedures of Company SWU Shiing, the First Mate, as a responsible person for managing the accident would lead and inspect the accident site. He also should close all watertight doors, hatches in the cargo hold areas, manholes, etc., while navigating in severe sea conditions in accordance with major navigating procedures.

(1)Delay in identifying the flood

When the ingress water detection system was operating due to the flood in the cargo hold area no.1, he did not check it immediately, thinking that it would be malfunctioning. As a result, response was delayed as the flood was examined 6~8 hours later. The weather and sea conditions were not peaceful of the time, however, considering the fact that it was possible to check the flood in the cargo hold no.1 area 6~8 hours after, the conditions at the time were deemed not as bad to inspect the area.

(2)Failure on closing all openings

When the cargo hold area no. 1 flooded, the bow of the ship would start to drop. Thus, all openings located on the bow should be closed tightly or the flood would be extended to further parts. However, First Mate did not conduct any measures to close the openings such as watertight doors on the upper deck, even after identifying the flood in the cargo hold area no.1

G) Factors on management

(1)Ship Inspection

The ship passed the ship inspection designated by the related laws. There was no pending ship inspection missing as of the day of the accident. But, the ship inspection by law is not enough to find and fix all defects in the ship. Therefore, the company who knows the ship well should have active intensions for preventive maintenance.

(2)Visiting ship and inspection

When entering either Korea or China, the ship was regularly inspected once a year or so. The crew was also asked about the status of the ship at those inspections. At the same time, major non-conformities had never been reported.

(3)Technical support

The company was optimistic about the situation when receiving the first report of the flood from the captain, and thus, failed to give any specific and effective technical support. (1) The emergency response center was organized almost 15 hours after the first report received from the captain. (2) As a result, they failed to close all openings in the ship and the ship continued to navigate at a high speed of 10 knots even when the cargo hold area no.1 was flooding. Further, the crew missed the proper time to leave the ship. In particular, when navigating at a high speed, the impacts on the body would be more severe, creating a more damage. Nonetheless, the company let the ship to continue to navigate.

H) Special safety standards of the bulk cargo vessel

(1)Conditions for damage stability

A solid bulk cargo vessel of over 150m in length, which is single sided in structure, who was built before July 1st, 1999, for the purpose of carrying solid bulk cargo with a density over 1,780 ㎏/

㎥, should be able to withstand a flood in the foremost cargo hold under any loaded condition, and should float well enough to maintain a balance condition even after the flood, when it carries the cargo up to summer load line.

(2)Structures and others

A solid bulk cargo vessel of over 150m in length, which is single sided in structure, who was built before July 1st, 1999, should (1) have enough strength in its transverse watertight bulkheads between two foremost cargo holds and a double bottom tank in the foremost cargo to hold in order to bear the flood in the foremost cargo hold, considering the dynamic effects of the ocean water in the flooded cargo hold, while complying with the strength standards for a double bottom tank and bulkhead of a bulk cargo vessel. (2) All bulk cargo vessels over 150m in length should be equipped with loading instruments to provide the information for a shearing force and bending moment. (3) All bulk cargo vessels should be equipped with water level detectors on each cargo hold, the ballast water tank, the collision bulkhead and void spaces except the chain storage locker. Also, measures should be provided to discharge or drain the bilge in these areas.

2.2 Cause of the accident

The ship was attacked on the portside of the bow by strong waves of 5~7m in height under the conditions that her plating areas were severely weakened due to the negligence of the inspection and maintenance of them. In such a situation, she kept navigating at a ground speed of 6~7m. Eventually, the aged plating areas were not able to sustain the impacts of the waves and were damaged, resulting in the ingress of lots of ocean water into the cargo hold area no.1.

When a calculation was attempted and concluded that the ship would not sink even with a completely flooded cargo hold area, the captain did not consider the possibility that the flood would spread to other parts if the bow dropped significantly. He, only counting on the results from the calculation, failed to establish the safety measure such as abandoning the ship, etc., and caused 13 crew members deaths or reported missing.

3. Lessons from the accident

A. Effective way of inspecting and maintaining the plating areas of the ship are required.

There have been more reports of submersion accidents of bulk cargo vessels in accordance with the weakening of body longitudinal strength, excessive shear stress, deficiency of damage stability conditions, or wearing or corrosion of the body structure. They were not even able to send out distress signals while sinking. Thus, IMO is reinforcing the conditions with respect to stability of bulk

cargo vessels or salvage condition, and at the same time, adopting an ESP (enhanced survey program) in order to reinforce ship inspection.

Although the subject matter ship passed all designated ship inspections, her plating areas were damaged by the wave impact from wind scale 7~8, and such damage resulted in the submersion eventually of the ship. It would never be easy to find the hidden defects on the plating areas. Failure of inspection and maintenance of such defects would bring the similar accident any time.

In order to prevent similar accidents, it would be important to increase the body strength, reinforcing the condition with respect to damage stability or effectively measuring the thickness of the plating areas. However, the more important things would be as follows, at the time of repairing or inspecting the plating areas: (1) When welding old steel plates and new plates, the following must be considered: effects of imbalance of the strengths, residual stress from wide range of repairs, and weakening the strength due to contacted damage. (2) Before replacing the plating areas, the following are to be required: inspection of cracks, regular survey of the ballast water tank which are not coated, and non destructive testing on the welded parts. Correspondingly, effective measures for inspection and maintenance of the plating areas should be developed in order to keep the plating areas in their best condition.

B. When estimating the risk factors, a possibility that the risk would likely happen should be considered.

Neither the captain nor the First Mate immediately checked the situation even when there were signs showing the flood in the cargo hold area no.1 with water leaking through the bilge lines or the indication on the ingress water detection system. They just thought that it would have been due to leakage of the hatches from navigating in severe sea conditions for a long period of time. If they had responded to the situation immediately after discovering the leakage through the bilge lines, the result may have been different.

Plus, they did not consider carefully the risk of submersion when the calculation showed that there would be no problem of stability even after discovering the flood in the cargo hold area no.1. The situation got worse while they were navigating and just checking the amount of water flooding in. There were a large number of casualties due to the submersion of the ship as the crew had not been able to leave the ship. The calculation about damage stability, etc. was based on many other factors including the long experiences and others to determine the ship's safety, and thus there were big gaps between the real situation and the result from the calculation. Accordingly, when estimating the risk possibility, it should always be interpreted for the most dangerous situation so as to reinforce the required actions for responding to emergency situations early enough.

C. While navigating under severe sea conditions, try to minimize the impact on the ship's body.

The subject matter vessel was an aged ship at over 20 year of ship's age. Thus, her overall strengths were weakened that there was a high possibility of being damaged by the impacts, compared to other vessels newly built. As a matter of fact, the subject matter accident occurred due to the damage of the plating areas in the cargo hold area no.1 while navigating under severe sea conditions.

To keep the safety of the ship under severe sea conditions, the ship herself needs enough resistance power, and the crew is required to know how to conduct the ship against wind and waves as well. When a ship navigates with strong waves to its bow or the stern under bad weather conditions, slamming or ingressing of waves to the deck can happen, resulting in the big impacts to the ship's body. An excessive speed of navigating would increase the wave impacts as vertical vibration or pitching becomes fierce. In such a situation, controlling the ship's relative motion by reducing the speed or changing the course within the allowable range of steering or stability could decrease the impact on the ship's body from the waves.

Therefore, in order to prevent a marine accident due to damage on the body in bad weather conditions, the wheel steering techniques such as changing course or reducing speed are required to minimize the impact to the ship.

D. The quick approach to the site is the best way to rescue people

When the Orchid Sun was sinking, the distress signal from her was delivered to other vessels around as well as via the satellite EPIRB to land. Thus, army helicopters from the Sultanate of Oman and other vessels around moved to the accident site immediately. The Bahama-registered cement carrier MegahCement, navigating only about 18miles from the Orchid Sun, was able to arrive at the site in about 2 hours and successfully rescued 7 distressed crew members. Another vessel, the Indian-registered oil tanker MaharshiKrishnatre, arrived at the site after the MegahCement and rescued 2 crew members too.

Considering the fact that 9 out of the 10 rescued crew members were rescued by these 2 vessels, it is important to consider how quickly other vessels should approach an accident site which can determine the success of the rescuing work. Plus, when there are risks such as flooding in the cargo holds, it would be more helpful to save human life and to minimize the number casualties, if a salvage vessel escorts them.

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