Report of the investigation of
the accident resulting in one fatality and one serious injury
during the mooring of the motor yacht

JEMASA

in Phuket, Thailand
on 18 February 2009.

Maritime Authority of the Cayman Islands
Strathvale House
North Church Street
PO Box 2256, George Town
Cayman Islands
KY1-1104

Casualty 01/2009

NOTE

The fundamental purpose of investigating an accident under the Cayman Islands Merchant Shipping Law, as amended, is to determine its circumstances and the cause with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame.

This report is not written with liability in mind and is not intended to be used in court for the purpose of litigation. It endeavours to identify and analyse the relevant safety issues pertaining to the specific accident, and to make recommendations aimed at preventing similar accidents in future.

Report of the investigation of the accident resulting in one fatality and one serious injury during the mooring of the motor yacht JEMASA in Phuket, Thailand on 18 February 2009.

SYNOPSIS

On 18 February 2009, the motor yacht JEMASA was mooring at a Yacht Haven Marina in Phuket, Thailand after returning from a voyage to Langkawi, Malaysia. Wind and tidal conditions were benign and mooring followed the yacht's normal routine. When four lines had been made fast ashore, a crew member placed the bridge wing controls in the "full ahead" position and closed the control station. Both engines were still running, but in the idle mode, and the action of putting the controls to full ahead engaged the propellers and the yacht moved ahead. The yacht broke free of its moorings. No mooring ropes parted but three of the mooring points in use on the quay failed. Two bystanders were struck by flying debris and / or recoiling mooring ropes. One person was hit in the legs and the other was hit on the head. Both were evacuated to hospital where the person struck in the legs underwent reconstructive surgery. The person struck in the head remained in a critical condition and died five days later.

After the moorings failed, manoeuvring control was taken by the main bridge manoeuvring station and the yacht quickly brought under control. The yacht was then safely moored back alongside the quay. Due to the design of the bridge wing control station, it was necessary to put the engine controls in the full ahead position before the control station could be closed.

In an effort to prevent a repeat of this accident, recommendations have been issued relating to the design of bridge wing control stations on yachts, the importance of proper procedural controls for mooring operations and the implementation of safety management systems under the ISM Code.

JEMASA alongside in Ko Phuket, Thailand

Glossary of Abbreviations, Definitions and Acronyms

Company	means the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the owner of the ship and on assuming such responsibilities has agreed to take over all the duties and responsibilities imposed by the ISM Code[1].
CISR	Cayman Islands Shipping Registry
DOC	Document of Compliance
DP	*Designated Person* under the ISM Code. A person with access to the highest level of management and with authority and responsibilities relating to safety and pollution prevention.
IMO	International Maritime Organization
ISM Code	International Safety Management Code
kW	Kilowatt
length	for the purpose of this report, *length* in relation to a vessel, is taken as the length measured between extremes, including bowsprits and stern davits/marlin boards[2].
LL Convention	International Convention on Load Lines, 1966 and Protocol of 1988, as amended
LR	Lloyd's Register
MACI	Maritime Authority of the Cayman Islands
MSI	Marina Systems International Co Ltd.[3]
SMC	Safety Management Certificate
SMS	Safety Management System
SOLAS Convention	International Convention for the Safety of Life at Sea, 1974 and its Protocol of 1988, as amended.
STCW Convention	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995 and 1997.
WYM	Wilson Yacht Management

[1] SOLAS IX/1.2
[2] AS 3962 – 2001 Section 1.3.9
[3] Not to be confused with *Marine Systems International Inc* of New Brunswick, Canada.

SECTION 1 – Factual Information

INCIDENT PARTICULARS

Vessel details:

Vessel Name	:	JEMASA
IMO Number	:	1008009
Ship Manager	:	Wilson Yacht Management
Port of registry	:	George Town
Flag	:	Cayman Islands
Type	:	Motor Yacht
Year of build	:	2002 by Hakvoort Shipyard; Monnickendam, Netherlands.
Delivered	:	April 2006
Classification	:	Lloyd's Register
Length (overall)	:	49.99 meters
Gross Tonnage	:	696
Engine Power	:	2028 kW
Number of propellers	:	2

Accident details:

Time and date	:	1710L on 18 February 2009
Location	:	"Yacht Haven Marina", Phuket, Thailand
Fatalities / injuries	:	One fatality, one serious injury.
Damage	:	Minor damage to yacht hull. Damage to shore side mooring arrangements.

NARRATIVE

(all times are "local".)

Prior to the accident

During February 2009, JEMASA was based at the Yacht Haven Marina on Ko Phuket, Thailand. The yacht was not engaged in charter activities and the beneficial owner or family were not onboard. A visit by potential yacht brokers had been arranged for the weekend of 21 / 22 February.

16 February 2009

On Monday 16 February 2009, JEMASA left Yacht Harbour Marina for a voyage to Langkawi in neighbouring Malaysia. The voyage was to enable JEMASA to take on fuel oil and duty free stores. In addition, visa restrictions made it necessary for crew members to leave Thailand every 30 days.

Langkawi lies approximately 150 nautical miles South East of Phuket and is a popular destination for yachts based in Phuket making so called "Immigration Runs" to comply with Thai visa requirements.

17 February 2009

JEMASA arrived in Langkawi anchorage at 08:00 on the morning of 17 February 2009. Crew passports were sent ashore to clear immigration formalities and JEMASA took on 30,000 litres of fuel oil from a bunker barge. After bunkering was complete the yacht spent the rest of the day alongside in the Royal Langkawi Yacht Club before departing for Ko Phuket at approximately 04:00 on 18 February 2009.

18 February 2009

The departure time of 04:00 was chosen so that the yacht's return to Yacht Haven Marina would coincide with the high tide at 17:00 on 18 February 2009. When the yacht was approximately one nautical mile from the marina, the master telephoned the marina manager to arrange for line handlers and to confirm the minimum water depth at the quay. The marina manager confirmed that he had JEMASA in sight and told the master that there would be at least 1m of under keel clearance as JEMASA entered the marina. Satisfied that appropriate arrangements were in place for mooring, the master slowed JEMASA to manoeuvring speed and transferred engine and steering control to the port bridge wing. JEMASA was manoeuvred alongside "port side to" without incident and four lines were secured ashore.

During the mooring operations, a single deckhand was manning the mooring station on the foredeck. As it is not possible to observe the strain and position of mooring ropes when operating the forward mooring winches, the deckhand was operating under the supervision of the master who was directing operations from the port bridge wing. With both forward lines secure the deckhand then moved aft to the bridge, while the master entered the bridge to order the engines shutdown with the yacht now moored alongside. The marina manager who was present on the quayside described the manoeuvring and docking as extremely competent and professional.

JEMASA has two bridge wing control stations that fold into the deckhouse when not in use. When the wing stations are deployed they extend the whole width of the walkway at bridge level and impeded fore and aft movement on their side of the yacht. (See figure 1)

When the deckhand came to the still open port bridge wing station, he put the engine controls in the full ahead position and closed the wing station. It is necessary to place the engine controls in this position because, when in use, they stand higher than wing control opening in the deck house when placed in the “neutral” position. (Figure 2)

At this time the main engines were running and engine control was still with the port bridge wing station.

Figure 1: Open Wing Station

Figure 2: Engine Control Height

The accident

When the engine controls were placed in the full ahead position the engines engaged and proceeded to power the yacht up the quay. At this point the deckhand was alerted by shouts from the quayside that the yacht was "in gear" and putting strain on the mooring ropes. The deck hand then reopened the bridge wing controls and brought the control levers back to neutral. At the same time, the master took engine control from the bridge and placed the engines astern to arrest the forward movement of the yacht. The action of the master was unable to bring the yacht to a stop before three of the mooring ropes pulled their attachment points from the quayside. The yacht was brought under back control, manoeuvred alongside and then made fast once again. At this time the engines were shut down.

Witnesses on the quayside and onboard JEMASA report hearing a "crushing noise" and seeing JEMASA moving up the quay and making contact with two yacht tenders that were moored directly ahead of JEMASA, forcing them off the quay. The three mooring ropes that were pulled from the quay recoiled violently. See *Appendix 2* or details of the mooring arrangements and damage to the quay side.

Two persons on the quayside were struck by flying debris and / or recoiling mooring ropes and knocked to the ground. *Victim 1* was a shore worker from a nearby yacht and sustained leg injuries, while *Victim 2,* who sustained head injuries, was a sixteen year old girl visiting friends of her parents in Yacht Haven Marina.

The immediate response to the accident

Berthed next to JEMASA was the support craft SURI[4]. Crew members from SURI were on the dock when the accident occurred and raised the alarm with the local ambulance authorities. Ambulances were also called from the marina office. A crew member from SURI who had been trained as an armed forces medic began to provide first aid to the injured persons. *Victim 1* was conscious but in obvious pain and distress. *Victim 2* was unconscious and suffering from traumatic injuries. Medical supplies from both SURI and JEMASA were made available on the quayside.

Also in the marina at that time were three vacationing medical doctors who quickly arrived on the scene and took charge of the medical care of the injured.

It was obvious to those in attendance that the *Victim 2* was in a serious condition and as SURI carries a helicopter; preparations began to fly the *Victims* directly to hospital without waiting for the arrival of local ambulances. Unfortunately, it was not possible to obtain the necessary air traffic control permissions to launch the helicopter in the time available.

About 35 minutes after the accident, ambulances arrived and the injured were transferred to hospital in Phuket along with the doctors who had taken over the initial treatment of the injured persons. *Victim 1* had sustained fractures to his legs and required reconstructive surgery in Phuket. *Victim 2* had sustained severe head injuries. She remained unconscious and unresponsive in a coma for 5 days. Life support was withdrawn on 23 February 2009 and she was pronounced dead shortly afterwards.

[4] SURI is the support craft for JEMASA. SURI extends the range and facilities of JEMASA by carrying additional small craft (including a helicopter), stores and fuel for JEMASA. See *Appendix 3* for an overview of SURI.

THE VESSEL AND COMPANY.

JEMASA was registered as a pleasure vessel of 696 GT and 49.99m overall length. The yacht held all necessary permissions and certificates to engage in commercial charters. As such, the yacht was required to comply with the Cayman Islands Merchant Shipping (Vessels in Commercial Use for Sport or Pleasure) Regulations, 2002. These regulations require, *inter alia*, that the yacht complies with the ISM Code and the MCA Large Yacht Code[5]. At the time of the accident, the yacht held a conditional "Certificate of Compliance[6]" issued by LR on 05 February 2009 and valid until 15 April 2009.

As a yacht of over 500GT and certified to engage in commercial charters, JEMASA is required to implement a Safety Management System under the ISM Code. The yacht held a SMC issued under the ISM Code by CISR. The Initial ISM audit was carried out in November 2006 resulting in one non conformity relating to "development of plans for shipboard operations" and one observation relating to "resources and personnel" being raised.

Wilson Yacht Management act as the *Company* for JEMASA and have assumed all duties and responsibilities under the ISM Code. WYM hold a DOC issued under the ISM Code by CISR. The last audit of WYM preceding the accident was carried out on 05 February 2009. Two non conformities were raised at this audit relating to "maintenance of ship and equipment" and "resources and personnel". In addition, one observation was raised relating to "reports and analysis of non conformities, accidents and hazardous occurrences".

THE MARINA

Yacht Haven Marina is a long established yacht marina in Northern Phuket, Thailand. In 2005 the marina began an expansion program aimed at attracting larger, so called "Super Yachts". The first stage of this expansion was the construction of the quay where this accident occurred.

Contractors based in Thailand and Australia were used in the design, construction and installation of the quay. The marina design and construction was undertaken be Marina Systems International (MSI) with detail design and verification services being provided by Australia based consulting engineers Patterson Britton & Partners Pty Ltd.

The quay was designed in accordance with guidelines given in Australian Standard™ AS 3962 – 2001 (Guidelines for the design of marinas), and constructed of mainly imported materials. Mooring cleats were cast in Australia and mooring bollards fabricated in Thailand. AS 3962 – 2001 sets out guidelines for the design of marinas suitable for vessels up to 50m in length[7]. *Note 1* of this standards states "*This document is intended for use as a guideline and should not be used as a design specification.*".

The quay is made up of floating concrete pontoons held in place by steel piles driven into the seabed. Outside the concrete pontoon blocks are soft wood wales which are held in place by rods which run

[5] A recognised equivalence to the SOLAS, LL and STCW Conventions for Large Commercial Yachts
[6] Full certificate title: "Certificate of Compliance with the provisions of the MCA Code of Practice for Safety of Large Commercial Sailing and Motor Yachts"
[7] AS 3962 – 2001: Section 1.1

through pontoons. Approximately every four pontoon blocks there is a gap to accommodate the steel piles driven into the seabed. This gap is also utilised for mounting shore power and utility stations.

SIMILAR INCIDENTS AND ACCIDENTS

This is the first such incident that has been reported to MACI. After the preliminary investigation into this accident was completed, MACI issued a "Flyer to the Large Yacht Industry" highlighting the inherent dangers involved with mooring operations in general and the specific hazards associated with engine controls that cannot be stowed in the neutral position. This flyer is included as *Appendix 4* to this report.

This flyer was widely circulated in the yacht industry and was reproduced in the September 2009 issue of *Seaways*, the magazine of the Nautical Institute. Since publication, MACI has received several unofficial reports of similar incidents occurring on other yachts. None of these incidents resulted in injury or failure of mooring equipment, but all concerned engine controls being moved from the neutral position to either stow the controls or fit weather covers.

It is apparent that this accident was not an isolated incident. Similar occurrences in the past have not resulted in formal reports being made because serious damage and injury did not occur.

STANDARDS, REGULATIONS AND GUIDANCE FOR MOORING OPERATIONS

SOLAS regulation II-1/3-8 and IMO Circular MSC/Circ.1175 provide requirements and guidance on towing and mooring equipment onboard ships. These requirements apply to all ships constructed after 01 January 2007. Although not retrospectively applied to JEMASA, the Circular contains pertinent guidance on methods to calculate "safe working loads". The mooring equipment and ropes onboard JEMASA exceeded the minimum recommendations in MSC/Circ.1175.

SECTION 2 – Analysis

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.

THE RESPONSE

The time from the engines being placed in the full ahead position and control being regained by the master was only a matter of seconds. The actions of the master and the crew in regaining control and safely mooring JEMASA back alongside were timely, appropriate and professional.

However, in the seconds when control of JEMASA was lost, three mooring ropes tore free of the quay and two bystanders were seriously injured by flying debris / recoiling ropes. It was fortuitous that three medical doctors were in the marina at the time of the accident as the injuries sustained (especially by *Victim 2*) were extremely severe and beyond normal ship board medical training.

CONSIDERATION OF CONTRIBUTORY EVENTS

Why were the engine control placed in the full ahead position?

Design Considerations[8]

Most large yachts are fitted with work stations on the bridge wings for docking the vessel. These work stations provide the field of vision and controls required for manoeuvring the yacht alongside a berth, tug operations (if required) and mooring operations. When not in use these stations are protected from weather by either fitting a cover or (as in this case) storing the control station in a recess in the deckhouse. A number of designs were examined from a variety of yacht builders and it was found that many require the engine controls to be moved from the neutral position before the cover can be fitted or the control station stowed.

One yacht builder stated that this was common in "*nine out of ten yachts*" and that, prior to learning of this accident, that it "*did not constitute a problem*".

On JEMASA the hazards associated with unintentionally engaging the engines was recognised and a plastic sign was fitted at the control station which read "BEFORE CLOSING TAKE OVER CONTROLS TO WHEELHOUSE" (figure 3).

Operational Considerations

This sign would not have been visible to the deckhand as he made his way aft from the foredeck (figure 4). In addition, the duties of the deckhand did not call for him to be familiar with the control station layout and he was not required to operate any of the controls.

[8] Wing control station layout is given in Appendix 5

Figure 3 View of plastic warning sign

Figure 4: Deckhand's view of console with warning sign obscured

Safety Management System

The ISM Code requires the *Company* to, *inter alia*, establish safeguards against all identified risks[9]. WYM addressed this requirement through section 9.6 of their documented SMS. Under "*General Ship Board Management*" the SMS states *"The Master should ensure that a risk assessment has been carried out to cover all work activities on board where there is a realistic risk of harm to personnel……. Once a risk assessment has been completed, a Safe System of Work should be developed for that job in order to mitigate the risk.*". Mooring operations are identified as potentially dangerous in section 2.3.1 of the SMS which states *"Mooring operations are potentially dangerous for personnel working in the mooring areas. Extreme care should be taken by all crew members".*

From the time the yacht entered service in 2006 until the time of the accident, no risk assessments had been undertaken onboard. No training in the conduct of risk assessments has been given to those onboard, beyond making reference to the "*Code of Safe Working Practices*[10]" and making a copy available onboard. Rather than formal written "plans", "instructions" or "Safe Systems of Work", informal "procedures" had evolved onboard to control such tasks as mooring and un-mooring.

In addition, Clause 7 of the Code calls for "*plans and instructions … for key shipboard operations concerning the safety of the ship and the prevention of pollution. The various tasks involved should be defined and assigned to qualified personnel*". In the SMS onboard only general advice is given on mooring in Section 2 of the "Deck Procedures".

The only specific mention of the engine controls is in Section 11 of the "Engine Room Procedures". This states "*At no time must the controls be handed to the Engine Room if there is a danger to navigation".*

The SMS onboard JEMASA was audited by CISR during November 2006, approximately six months after the yacht entered service. No mention was made to the absence of risk assessments or detailed plans and instructions for key shipboard operations. Following the audit a full term SMC was issued valid until November 2011.

Internal audits by WYM in 2006, 2007 and 2008 also failed to address the lack of risk assessments onboard.

Post investigation note: Since the completion of this report, amendments have been adopted to the ISM Code. One of these amendments concerns risk assessments onboard ships. Whereas the need for risk assessments has always been implied in the ISM Code; Clause 1.2.2.2 (referenced above) has been amended to make this an explicit requirement. The clause now reads: "assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards". *This amendment will enter into force on 01 July 2010.*

[9] ISM Code Part A: Clause 1.2.2.2

[10] *Code of Safe Working Practices for Merchant Seamen* as published by the UK Maritime and Coastguard Agency.

Actions onboard.

When the deckhand was making his way aft from the foredeck, he saw that the master was on the bridge and talking on the telephone. He made eye contact with the master and then proceeded to pack away the wing station. He did this by placing the dust cover on the echo sounder display, checking the "*blue light*" was out, putting the engine controls full ahead and closing the wing station. The deckhand took "eye contact" with the master as consent to proceed with closing the station.

The deckhand stated that he checked that the "*blue light*" (figure 5) was out before closing the control station, believing that when illuminated this light indicated when the control station was "live" and in control of the vessel. The "*blue light*" refers to the bow thruster control only. Engine control is indicated by the yellow light shown in Figure 6. This light is small and its status is difficult to determine in bright daylight.

Figure 5: "Blue Light" believed by deckhand to indicate console status

Figure 6: "Yellow Light" indicating Engine Control

Rather than the documented *Safe System of Work* required by SMS Section 9.6, an informal procedure had evolved onboard for shutting the wing station on completion of mooring activities. It was the normal practice for the first member of the deck crew who had completed their other duties to close the wing station after verbal confirmation from the master that it was safe and appropriate to do so. Often the master would close the wing station himself if he had finished his post mooring activities before a member of the deck crew had arrived on the bridge.

In this instance, the deckhand mistook eye contact with the master for the confirmation that it was safe and appropriate to close the wing station and put the engine controls full ahead in the belief that lack of illumination on the bow thrust indicator meant the entire wing station was "dead".

Although the deckhand placed the engine controls in the "full ahead" position, this does not indicate that the engines immediately moved to full speed. To prevent engine overload and large rapid fluctuations in engine speed, the engine controls provide the "input" into the engine management system which keeps the actual power output of the engines within safe, predetermined limits.

Why did the mooring points on the quay fail catastrophically?

Design Considerations

The marina extension where the accident occurred was designed and constructed to Australian Standard™ *AS 3692 – 2001 Guidelines for design of marinas*. This standard was chosen because it is recognised internationally and deals specifically with marinas serving pleasure craft, rather than docks and wharves serving commercial shipping. The standard is applicable for recreational marinas providing berthing facilities for recreational craft and small commercial vessels up to 50m in length.

Mooring loads are transferred from the yachts to cleats and bollards attached to the floating dock and then through the dock structure to steel piles driven into the seabed. When designing this dock, primary consideration was given to the "parked loads" from yachts. That is, loads associated with windage, wave and current when the yacht is moored alongside. This is consistent with the approach outlined in Section 4 of AS 3962 – 2001.

In section 4.9 of AS 3692 – 2001, "Berthing and Mooring Loads" are considered in terms of the transfer of energy to the dock structure and retraining system by an impact from the largest "design vessel". The "design vessel" is assumed to be travelling at 0.3 m/s, or 0.2 m/s for vessels over 25m in length. Tension loads on mooring hardware during berthing and un-berthing are not specifically considered in AS 3692 – 2001. This applies to both the normal mooring loads and the exceptional loads associated with emergency situations.

Witnesses onboard JEMASA and on the quayside estimate that the time between the engines being put full ahead and control being restored at no more than 5 – 8 seconds. With the yacht tethered in still water this is insufficient time for the yacht to develop its maximum theoretical "bollard pull[11]". Propeller design, lack of initial water flow and the engine management system would all limit the "bollard pull" developed by JEMASA during this period.

[11] "Bollard Pull" is a term most often used to describe the pulling capacity of towing vessels.

Although higher than normal, the mooring loads generated would have been similar to a vessel of JEMASA's size and horsepower manoeuvring alongside by means of "steaming on a spring".

Operational Considerations

Yachts berthing on the quay used by JEMASA have a choice of three attachment points for mooring lines. These are:

1. Cast aluminium cleats attached to the dock by bolts through the timber wales, as shown in figure 7;

Figure 7: Cast Mooring Cleat

2. Fabricated steel bollards bolted through the timber wales and into the concrete pontoons, as shown in figure 8; and

Figure 8: Fabricated Mooring Bollards

3. Moored directly to the steel piles that anchor the floating quay.

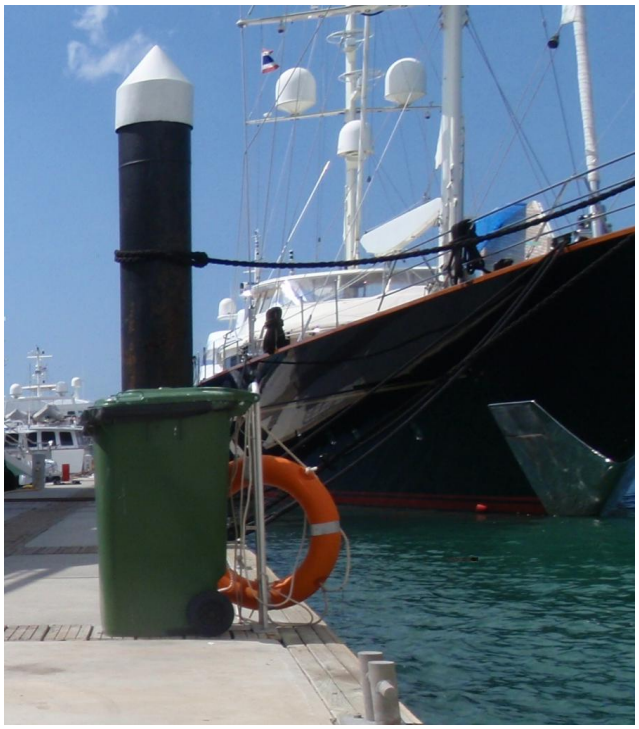


Figure 9: Steel Pile used for mooring.

Appendix 2 shows the mooring arrangement on JEMASA prior to the accident. When JEMASA moved forward three of the mooring ropes were put in tension and one was made slack.

The attachment points of the three mooring ropes in tension failed as follows:

The cleat holding the stern line failed (Figure 10). When the cleat failed the mooring rope recoiled and part of the cleat was sent inboard where it struck the superstructure. This cleat had insufficient strength to withstand the abnormal mooring loads caused when the engines on JEMASA engaged ahead.

Figure 10: Failed Stern Cleat

The cleat holding the head line failed (figure 11), causing the mooring rope to recoil. This cleat also had insufficient strength to withstand the abnormal mooring loads caused when the engines on JEMASA engaged ahead.

Figure 11: Failed headline cleat

The mounting of the bollard holding the forward back spring failed and the entire bollard arrangement became detached from the quay (figure 12). When the mooring rope recoiled, it brought with it the bollard which was still attached and sent wood debris flying up the quay. It is believed that it is this debris and recoiling mooring rope which struck the two victims.

Figure 12: Bollard pulled from quay

The failure mode of the bollards differed from the failure of the cleats in that the bollard themselves had sufficient strength to cope with the loads, but its attachment to the quay did not. Normally these bollards are mounted between two adjacent concrete pontoons and are held in place by two rods running through the entire thickness of the pontoons. The bollard that failed was mounted between one pontoon block and one of the spaces between pontoons for the steel piles and utility

stations. This bollard was held in place by a single rod running through the pontoon block and a bolt connected to a backing plate behind the soft wood wales.

When the load on this bollard was increased and the soft wood wales failed, it placed a torque reaction centred on the single through pontoon rod. In turn, this rod failed and the bollard was freed from the quay.

Figure 13: Bollard mounted through two concrete pontoons

Figure 14: Failed bollard mounting through one concrete pontoon and one backing plate.

It was stated that the cleats were used primarily for “tying up” and mooring ropes are then transferred to more substantial anchor points (bollards or directly to piles) once the yacht is safely berthed. This practice should be discouraged as exceptional mooring loads are much more likely to be generated during mooring and unmooring than when a vessel is laying alongside.

Why were people not involved in the mooring operation struck by the recoiling mooring ropes / flying debris?

When JEMASA was mooring there were a comparatively large number of persons either transiting the quay or observing JEMASA berthing who were not playing an active part in mooring operations. Such persons included the crew of other yachts, the marina manager and assistant manager, shipping agents for JEMASA, shore workers (including *Victim 1*) and general spectators (including *Victim 2*). Mooring operations are potentially dangerous situations where large amounts of stored energy can be instantaneously released when equipment fails, as was the case with this accident.

The amount of stored energy and the potential consequences of its uncontrolled release increase with vessel size. JEMASA was on the very limit of the design guidelines for the marina at 49.99m in length. As Yacht Haven Marina has grown to accommodate ever larger yachts, no restrictions have been put in place to restrict access to the immediate vicinity of mooring operations.

FATIGUE

Fatigue has been shown to be a contributory factor in many accidents. Chapter VIII of the Code to the STCW Convention requires that all persons should be fit for duty, such that:

> *1. All persons who are assigned duty as officer in charge of a watch or as a rating forming part of a watch shall be provided a minimum of 10 hours of rest in any 24 hour period.*
>
> *2. The hours of rest may be divided into no more than two periods, one of which shall be at least 6 hours in length.*
>
> *3. The requirements for rest periods laid down in paragraphs 1 and 2 need not be maintained in the case of an emergency or drill or other overriding operational conditions.*
>
> *4. Notwithstanding the provisions of paragraphs 1 and 2, the minimum period of ten hours may be reduced to not less than 6 consecutive hours provided that any such reduction shall not extend beyond two days and not less than 70 hours of rest are provided each seven day period.*
>
> *5. Administrations shall require that watch schedules be posted where they are easily accessible.*

The hours of work and rest of the crew onboard JEMASA for the period leading up to the accident were examined and found to comply with the STCW requirements. There is no indication that fatigue on the part of any of JEMASA’s crew was contributory factor in the cause of the accident.

SECTION 3 – Conclusions

SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT

As with most accidents, it is not possible to cite a single event or action as the “cause”. Rather a sequence of events and circumstances ultimately led to the accident occurring.

1. The design of the wing control station introduced an unnecessary risk into mooring and unmooring operations by requiring the engine controls to be placed in the full ahead position before the control station could be closed.

2 The fitting of the plastic warning sign on the control station proved insufficient to ensure that control was transferred to the bridge before the engine controls were placed full ahead and the control station closed.

3. Failure to follow SMS Section 9.6 of the safety management system onboard contributed to a lack of proper procedural control over mooring activities, despite such activities being identified as potentially dangerous in SMS section 2.3.1.

4. A lack of familiarity with the operation and function of the wing control station controls led the deckhand to believe the station was disconnected when it was still in control of the engines.

5. The shore side mooring equipment and its attachment to the quay lacked sufficient strength to handle the increased mooring loads generated when JEMASA moved ahead.

6. The lack of access restrictions to the quayside during mooring operations led to two persons not involved in the mooring of JEMASA being struck be recoiling mooring ropes / flying debris.

SECTION 4 – Recommendations and Actions Taken

001/2010 **Wilson Yacht Management** are recommended to:

i. Ensure that all risk assessments required by the SMS are carried out, properly documented and Safe Systems of Work are developed and implemented onboard all managed yachts.

ii. Provide training in conducting risk assessments to masters and crew onboard managed yachts, as required.

iii. Make such modifications as may be required onboard managed yachts to remove, reduce or mitigate any risk of inadvertently engaging engines when closing bridge wing controls.

002/2010 **The Cayman Islands Shipping Registry** are recommended to:

i. Inspect wing control station covers as part of routine yacht surveys and bring any potentially hazardous arrangements to the attention of masters for rectification.

ii. Ensure that safety management systems are fully implemented, especially in relation to risk assessments and development of safe systems of work, at all levels in the organization prior to the issue of any full term Safety Management Certificate.

003/2010 **Yacht Haven Marina** are recommended to:

i. Consider both the normal mooring loads and exceptional mooring loads associated with emergency situations generated by the largest “design yacht” when selecting and attaching mooring hardware.

ii. Consider introducing controls to the immediate area where mooring operations are taking place to limit access to those actively involved in the mooring operation.

ACTIONS TAKEN

During and subsequent to this investigation the following actions have been taken aimed at preventing a similar accident occurring in the future.

Wilson Yacht Management has introduced a standard companywide Risk Assessment Methodology which is now in use onboard all managed yachts. As a result, safe systems of work are being developed. As a result generic checklist and procedures in the Safety Management System are being made “yacht specific”.

Training in the conduct and documenting of risk assessments is being delivered to masters and crews of managed yachts as part of the routine superintendent / DP visits onboard. All other managed yachts have been confirmed as having a wing control station layout that does not introduce similar risks of inadvertently engaging engines when securing the control station.

Onboard **JEMASA,** modifications have been made such that it is no longer necessary to move the engine controls from the neutral position in order to stow the wing control stations, as shown below:

In addition and as part of the master’s standing orders, an engineer or senior deck officer must remain in the wheel house or at the wing station controls to prevent unintended operation of the engine controls during manoeuvring or transfer of command to or from the wing stations.

The status of the wing station controls now forms part of the routine documented checks to be carried out prior to entering or leaving port.

Yacht Haven Marina has now introduced access control measures to docks and quays when large or powerful motor yachts are manoeuvring alongside. In such cases access to quays is restricted to trained marina staff who handle the lines of the manoeuvring yachts.

When large yachts are mooring, care is taken to ensure that the quayside is free of any unnecessary obstructions such as stores trolleys and bicycles. Additional “bollard type” moorings have been installed and the “cleat type” mooring points are only used for small yachts and boats.

The **Cayman Islands Shipping Registry** has issued a Safety Flyer of all registered vessels, highlighting the hazardous associated with mooring in general and the particular circumstances surrounding this accident. The flyer (See Appendix 4) was circulated to the Designated Persons of all companies holding a Document of Compliance issued on behalf of the Cayman Islands.

Inspection of the closure or cover arrangements for bridge wing control stations is now a routine part of surveys carried out on yachts by CISR surveyors. In addition, similar arrangements to those present on **JEMASA** have been identified during the construction of a number of new yachts. This has led to several design changes being made prior to the yacht's completion and delivery.

A revised and updated comprehensive set of instructions for the guidance of surveyors and auditors is currently under development.

Appendices

Appendix 1: “Yacht Haven Marina”

Appendix 2: Mooring arrangements and subsequent damage

Appendix 3: SURI; support craft to JEMASA

Appendix 4: Flyer to the Large Yacht Industry

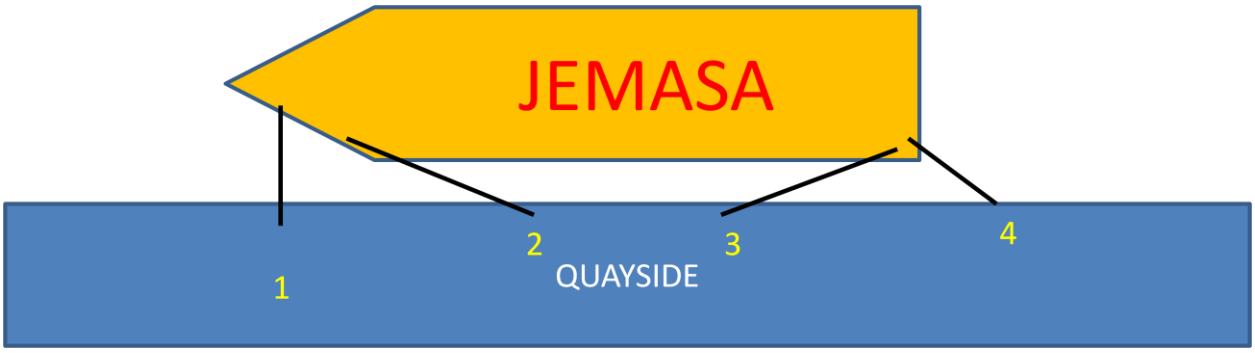
Appendix 5: Wing Station Layout

YACHT HAVEN MARINA

Figure 15: Arial photo of Yacht Haven Marina (C) SKYCAM

Figure 16: Approaches to Yacht Haven Marina (c) YHM

MOORING ARRANGEMENTS



At the time of the accident, JEMASA had four mooring lines secured to the quay as represented in the above diagram. When JEMASA moved ahead, lines 1, 2 and 4 pulled from the quay. All mooring ropes were Nylon Double Braid ropes of 56mm nominal diameter and with a minimum tensile strength of 805.1 kN.

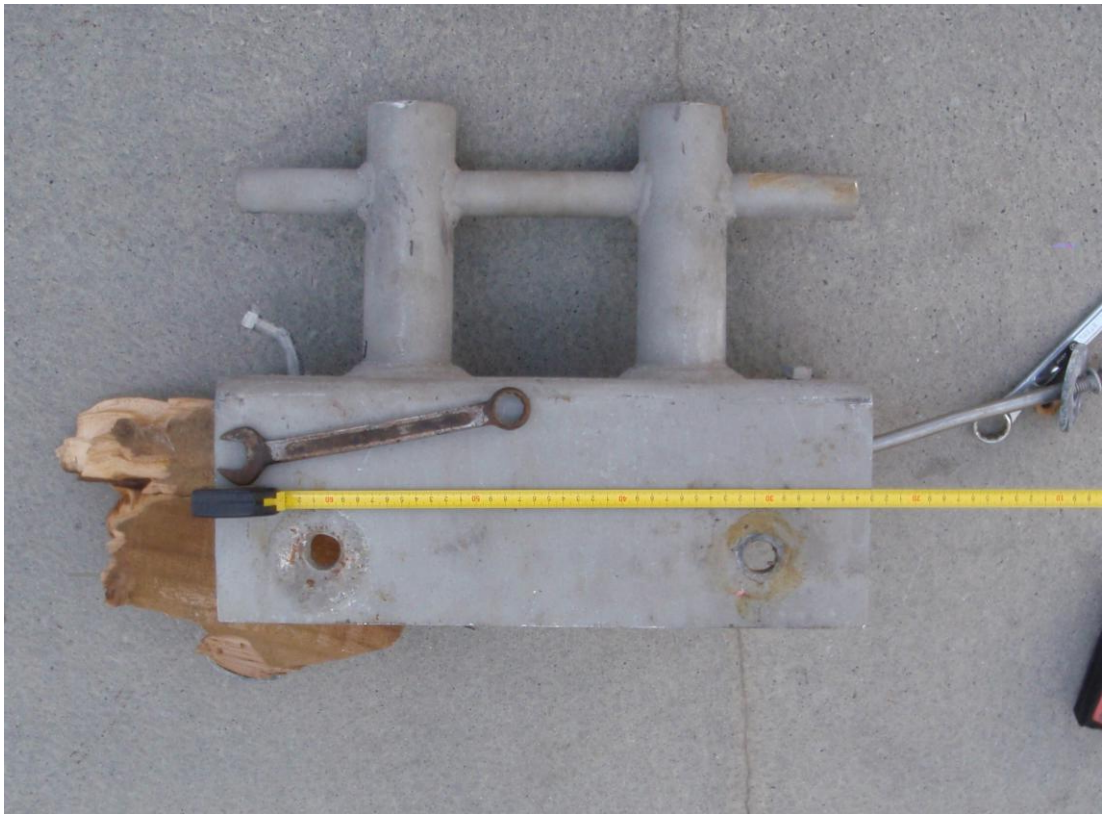
Figure 18: Typical Cleat Fracture

Figure 17: Nylon Double Braid Ropes

Figure 19: Bollard Walles Failure

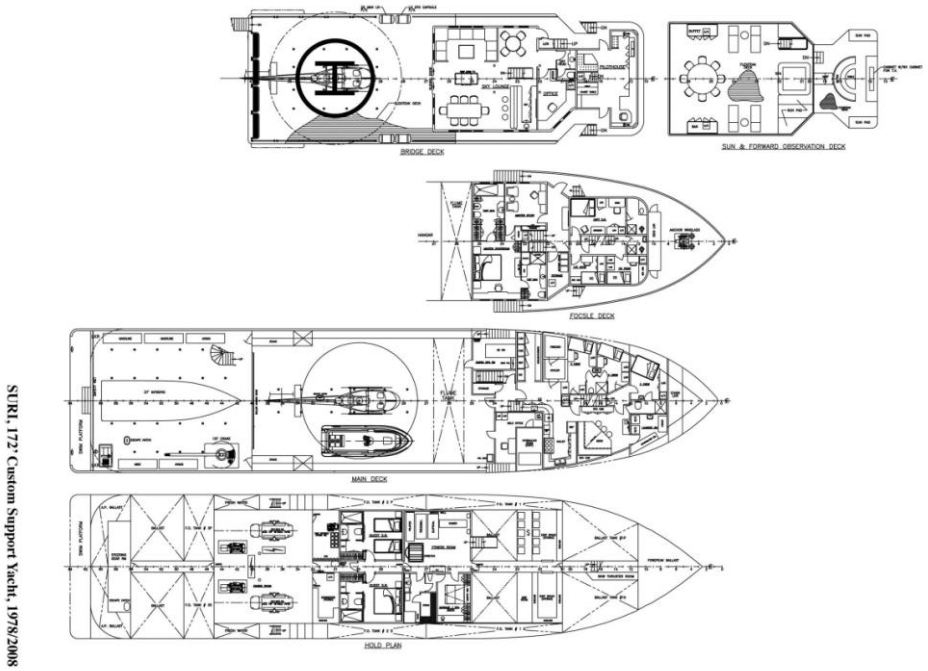
Figure 20: Damage to quayside

Figure 21: Recovered mooring bollard



SURI

Figure 23: SURI; JEMASA support craft



CAYMAN ISLANDS SHIPPING REGISTRY

Maritime Authority of the Cayman Islands

FLYER TO THE LARGE YACHT INDUSTRY

Fatal accident during mooring operations.

A large yacht (600 GT, 50m LOA) was berthing at a marina in South East Asia. Wind and tidal conditions were benign and the arrival and mooring procedures followed the yacht's normal routine. During the mooring operation the yacht was being manoeuvred from the port bridge wing control station. When not in use, this station folds into the bridge house for storage.

Due to the design of the bridge wing control station it is essential that the controls are deactivated prior to closing the station. It is necessary to put the engine controls in the "full ahead" position before the control station can be closed.

After the yacht had completed mooring, with four lines ashore, a crew member placed the bridge wing controls in the "full ahead" position and closed the control station. When the control station was closed, the yachts engines were running with control still at the port bridge wing station.

The engines engaged, the yacht proceeded to move ahead and the yacht broke free of its moorings. No mooring ropes parted but three of the mooring points in use on the quay failed. When the moorings failed, two bystanders on the quay were struck by flying debris and / or recoiling mooring ropes. One person was hit on the legs which were fractured. The other person was struck on the head and sustained serious injuries.

Both were evacuated to hospital. The person struck on the legs underwent reconstructive surgery and is expected to make a full recovery. The person struck on the head remained in a critical condition and died five days later.

After the moorings failed, manoeuvring control was taken by the main bridge manoeuvring station and the yacht quickly brought under control. The yacht was then safely moored back alongside the quay.

Safety Issues

- The risks in conducting mooring operations must be rigorously assessed and safe working practices developed. Each vessel should have a set of guidelines for achieving a safe mooring which can be modified to suit operational or environmental circumstances.

- Where novel or unusual designs introduce additional risks, these should be properly assessed and appropriate control measures introduced. Removal or elimination of such risks should be considered in preference to introducing procedural controls aimed at reducing or mitigating the risks.

- When choosing suitable mooring points ashore for the vessel (bollards, cleats, etc), both the normal mooring loads and exceptional loads associated with emergency situations should be considered.

- Mooring operations are potentially dangerous situations where large amounts of stored energy can be instantaneously released if mooring equipment fails. This can result in serious injury and death. Persons not involved in the mooring operation should be kept at a safe distance until the operation is complete.

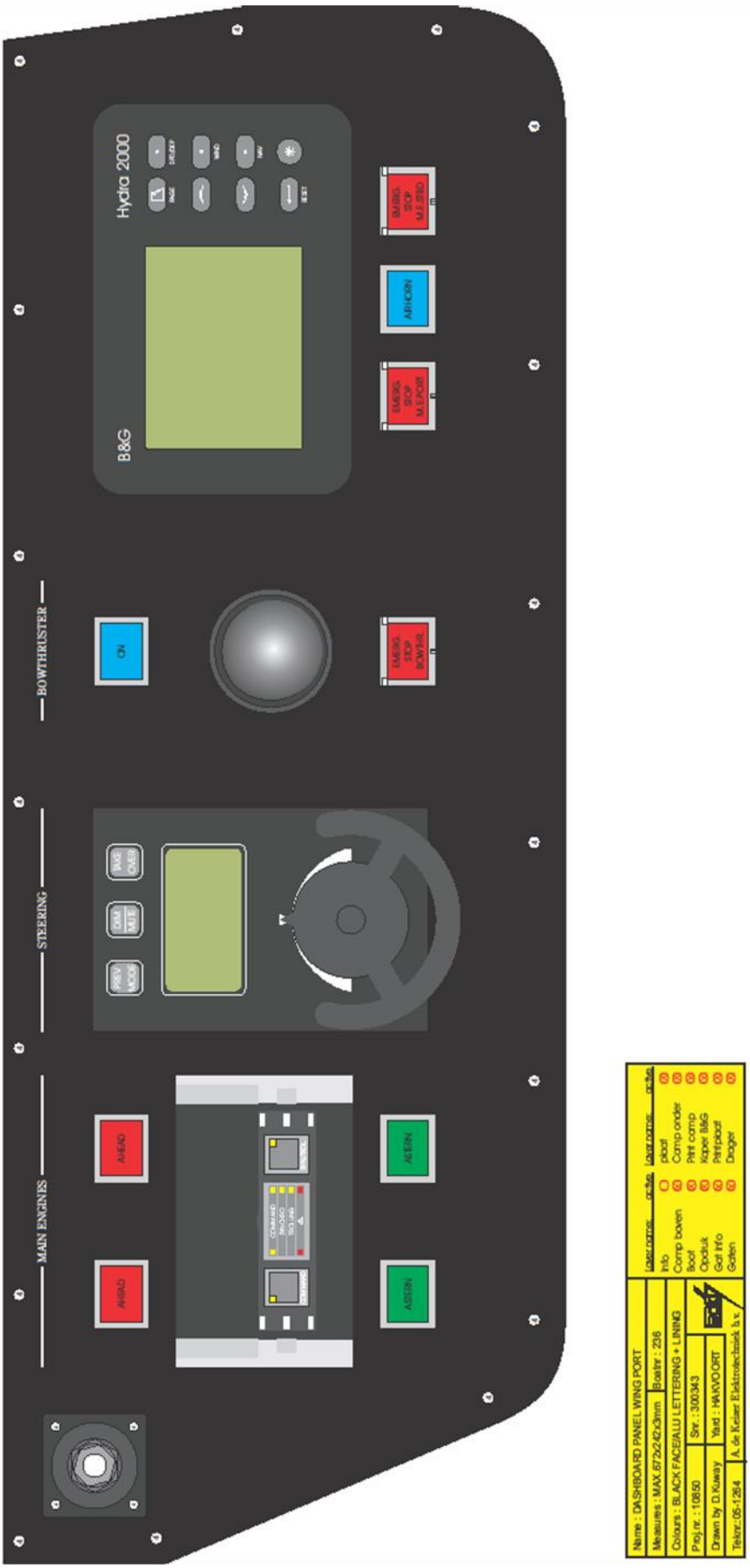
- Detailed information and guidance on mooring operations is available in publications produced by the Nautical Institute, the UK Maritime and Coastguard Agency (MCA) and the Oil Companies International Marine Forum (OCIMF).

NOTE

This document, containing urgent safety information, has been produced for marine safety purposes only, on the basis of information available to date. The sole objective of the investigation of any accident which is conducted under the Cayman Islands Merchant Shipping Law (2008 Revision) is the prevention of future accidents through the ascertainment of its causes and circumstances. It is not the purpose of an investigation to determine liability or, except as it is necessary to achieve its objective, to apportion blame.

The Cayman Islands Shipping Registry (CISR) is carrying out an investigation into this accident. The CISR will publish a full report on completion of the investigation. The report will be available from www.cishipping.com.

28 February 2009


Hydra 2000
B&G
BOWTHRUSTER
STEERING
MAIN ENGINES
AHEAD
ASTERN
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Measures : MAX.672x242x3mm
Boatnr : 236
Colours : BLACK FACE/ALU LETTERING + LINING
Proj.nr. : 10850
Snr. : 300343
Drawn by D.Kuway
Yard : HAKVOORT
Telnr: 05-1284
A. de Kaiser Elektrotechniek b.v.
Lees printer
Info
Comp boven
Boot
Opduik
Got Info
Geen
Lees printer
pilot
Comp onder
Print comp
Kiper B&G
Print boot
Dreger