Report on the investigation of

the loss of one man overboard

from the sailing yacht

Pastime

English Channel

17 March 2006

Marine Accident Investigation Branch
Carlton House
Carlton Place
Southampton
United Kingdom
SO15 2DZ

Report No 25/2006
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Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2005 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 13(9) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

ABYA	-	Association of Brokers and Yacht Agents
BMF	-	British Marine Federation
CORGI	-	Council for Registered Gas Installers
DF	-	Direction Finder
EP	-	Estimated position
GPS	-	Global Positioning System
GRP	-	Glass Reinforced Plastic
Hp	-	Horse Power
IAMSAR	-	International Aeronautical and Maritime Search and Rescue Manual
ICC	-	International Certificate of Competence
kW	-	KiloWatt
LSA	-	Life Saving Appliances
MCA	-	Maritime and Coastguard Agency
RNLI	-	Royal National Lifeboat Institution
rpm	-	revolutions per minute
RYA	-	Royal Yachting Association
STCW95	-	International Convention on Standards of Training, Certification of Watchkeeping for Seafarers, 1978, as amended in 1995
UTC	-	Universal Co-ordinated Time
VTS	-	Vessel Traffic Services
YBDSA	-	Yacht Brokers, Designers and Surveyors' Association

SYNOPSIS

On 17 March 2006, a 9 metre leisure yacht was being delivered from Hamble to Plymouth. On board were the owner and a delivery skipper. At about 2330, the delivery skipper went overboard. Due to electrical power problems on board, the GPS was not functioning, and although the alarm was raised by VHF radio, the owner was unable to give his position, and the VHF radio soon stopped operating. A search and rescue operation involving three RNLI lifeboats, five merchant ships and a coastguard helicopter, eventually located both the skipper's body and the yacht.

The owner had purchased the yacht a little over 1 month before the accident, and it had been kept ashore awaiting delivery by sea. The yacht was launched in the morning that she sailed, with the owner and delivery skipper meeting for the first time that same morning. After familiarising themselves with the yacht, fuelling and storing was completed by mid-afternoon, and they set off.

The weather forecast was for east or north easterly winds of force 5-7. With this in mind, the smaller, self tacking jib was set, with the mainsail uncovered but not hoisted. The engine was kept running and the yacht motor-sailed down the West Solent, making 9 knots. On passing the Needles, the skipper declared it was time they clipped on, and ensured that the owner was wearing his safety line, and that it was attached to a strong point. He failed to put on his own safety line.

At about 1900, shortly after clearing the Needles Channel, the engine overheat alarm sounded, and the engine was stopped. The voyage continued under sail, but about 2 hours later all electrical power was lost. The skipper went below to investigate, and managed to restore the electrical supply by overriding the low voltage trip on the distribution panel. This kept power to the lights and instruments for a further hour, but the services progressively failed as the battery power reduced, eventually leaving them with just the light on the compass and the dial of the VHF radio.

As both men were feeling seasick, they had decided to doze in the cockpit, rather than sleep below. The owner made himself comfortable in the port aft corner of the cockpit. The skipper was helming and was sitting on the port side ahead of the owner.

It would appear that the delivery skipper fell, or was washed overboard in heavy weather. The owner was awoken by a shout, and was hit on the head as the skipper fell overboard. The skipper was still not wearing his lifeline. The owner, who could see the light on the skipper's lifejacket astern, threw the rescue horseshoe and tried to turn the yacht to get to him. But the direction of the wind and sea state rendered this impossible. He therefore tried to start the engine, but there was insufficient battery power. Recognising that he needed assistance, the owner then attempted to send out a "Mayday" call by VHF radio. There was enough battery power to run the VHF set, but the GPS receiver had switched off due to low power, so he could not give his position. The coastguard was able to triangulate the yacht's transmission, and started a search and rescue operation, which, 3 hours later, discovered the skipper's body and the yacht. The owner was taken ashore by an RNLI lifeboat, suffering from shock and exhaustion, and the yacht was abandoned 16 miles offshore.

The yacht was recovered, undamaged, the following day and towed to Dartmouth.

Notwithstanding the tragic consequences of this accident, the MAIB has concluded that the safety issues identified during its investigation do not warrant specific safety recommendations on this occasion. However, an article about this accident, and the safety issues it highlighted, has been prepared and distributed to the leisure industry through the yachting press. The article has also been sent to the YBDSA, RYA and RNLI who are to promulgate it to their membership.

Figure 1

Yacht *Pastime*

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF PASTIME AND ACCIDENT

Vessel details

Port of registry	:	On the Small Ships Register No SSR40173
Flag	:	UK
Type	:	Maxi 909FC
Built	:	Mariestad, Sweden, 1990
Construction	:	GRP
Length overall	:	9.0m
Gross tonnage	:	3.2t
Engine type	:	Volvo Penta 2002 Sail-Drive Propulsion
Service speed	:	About 5.5 knots
Other relevant info	:	6 berth sailing cruiser

Accident details

Time and date	:	2340 on 17 March 2006
Location of incident	:	11 miles south east of Portland Bill 50º22'N 002º11.6W
Persons on board	:	2 – owner and delivery skipper
Injuries/fatalities	:	Loss overboard of delivery skipper
Damage	:	None

1.2 CREW BACKGROUND

1.2.1 Delivery skipper

David Clear, *Pastime'*s delivery skipper, was aged 42 and a plumber by trade. Aside from delivering his own vessel, this was his first employment as a delivery skipper, and he was hoping that it would be the start of a new career. He had taken part in the RYA training schemes, and held the following certificates:

Coastal Skipper Certificate of Competence to Sail – commercial endorsement

Yachtmaster Offshore Certificate of Competence – commercial endorsement

International Certificate of Competence (ICC)

VHF Operators' Certificate

GMDSS Short Range Certificate

Basic Sea Survival

RYA First-Aid Course

RYA Diesel Engine course.

He had completed a cruising log to support his application for RYA qualifications, and this showed that his sailing experience had been in yachts of a similar size to *Pastime*, mainly crewing around the Solent and South Coast of the UK. It had also included a number of holidays sailing in the Canary Islands, and some longer voyages to the Cape Verde Islands.

His qualifications met the requirements of the Small Vessel Code for the commercial operation of a vessel of this size on a voyage in these waters.

The skipper carried a number of articles of personal safety equipment with him. This included a lifejacket, which he was wearing at the time of the accident, and a safety line and harness, which were found still in his bag when the yacht was recovered.

The skipper was CORGI registered for his business as a plumber. This registration is renewed annually, and requires all gas operatives to hold a valid certificate of gas safety competence. The certificate is valid for 5 years, and is re-validated after completion of a refresher course. The skipper was due to start his refresher course on Monday 20 March, so needed to complete the voyage on *Pastime* by the previous day. This was the last opportunity for him to take the course before his CORGI registration would lapse.

1.2.2 Owner

Pastime's owner was a 53 year old dentist, who was returning to sailing after a 15 year gap. He had previously owned a yacht similar to *Pastime* and part-owned a second, higher performance racing yacht. Family commitments meant that he sold his boat and effectively gave up sailing in 1991.

In 2005, he decided to take up sailing again and, for 6 months or so, he looked for the right boat to resume his hobby. He eventually decided on *Pastime*, and purchased her in February 2006 in Southampton. Keen to get the yacht back to the west country, he was aware that his own sailing skills needed refreshing, and that he would need assistance to deliver the yacht. Her delivery was included in the purchase price, and the skipper appointed by the vendors. It was agreed that the owner would be part of the delivery team.

During his last period as a yacht owner, he had attended and passed the RYA Day Skipper shore-based course, but had never undertaken the practical course, neither had he taken any of the other courses that the RYA offers.

1.3 NARRATIVE

1.3.1 Preparations and planning

The owner had purchased *Pastime* in February 2006, from a vendor at Port Hamble Marina, Southampton. He had previously seen the yacht for sale on the internet, but at the time was considering purchasing a new yacht, and had not looked it over. The yacht was purchased from previous owners by the vendors, who had a survey carried out for valuation purposes. This survey was subsequently re-assigned to the new owner, but it is of note that it was a structural survey only, and did not include an inspection of the engine or electrical systems. As part of the purchase agreement, a delivery skipper was engaged to assist in the delivery of the yacht to Plymouth, where it was to have a permanent berth. The owner felt that, as he had not sailed for 15 years, this would be a good opportunity to get to know his new yacht while under the tutelage of an experienced yachtsman, so he decided to accompany the skipper during the delivery voyage. *Pastime* was being stored on a dry hard stand in the marina. A tentative agreement was made to launch the yacht in mid-March, subject to weather conditions and contract completion. The vendors contacted the skipper in mid-February to confirm his availability for mid-March, and arrangements were put in place for a launch date of Friday 17 March.

During the week before the launch, the owner and brokers spoke several times on the telephone to discuss the weather forecast and to arrange for the yacht's batteries to be trickle charged. The engine had been winterised after lay-up on 25 November 2005, and it was arranged for de-winterisation before sailing. The long range weather forecast indicated that the conditions would be reasonable for the weekend, and the launch date of Friday 17 March was finally confirmed.

When the owner arrived at the marina on the Friday morning, he found that his yacht had not yet been launched, but that preparations to do so were underway. The engine had been de-winterised that morning, and the engine turned over to prove the system. Taking advantage of the delay, he went to the nearby yacht chandlers to buy foul weather clothing and some other items of small gear. Returning to the marina, the owner found that the delivery skipper had just arrived. The owner and skipper then went to watch the launch. It was now about midday. The owner, skipper and the vendor's maintenance man boarded *Pastime* once she was launched to move her to a lay-by berth. The engine would not start, and the maintenance man was not a mechanic, so the vendor was asked to come to the yacht to rectify the situation. He managed to start the engine by using the cold-start procedure, which he then demonstrated.

Satisfied that the engine could now be run, they motored to the fuelling pontoon, where they filled the main tank and a spare 20 litre jerry-can. They checked the gas and water, and then returned to the marina, where it took four or five attempts to get back alongside as the yacht was being blown off the berth. Once *Pastime* had berthed safely alongside, the owner and skipper familiarised themselves with her layout, including the disposition of ropes, and where the sea-cocks and electrical switches were. Having satisfied themselves that they had a good understanding of the yacht's layout, they collected their personal gear and stowed it on board. The skipper was also given a valise liferaft and a hand-held GPS receiver by the vendors.

The inshore waters weather forecast for the day was discussed. This predicted winds from the east or north-east of force 5-7 which both the delivery skipper and the owner considered acceptable for the voyage.

With the yacht now ready for departure, the skipper indicated to the owner that they would need to make a good speed through the Solent if they were to pass through the Needles Channel with a favourable tide. No further passage planning took place prior to departure, and there was no discussion between the skipper and owner on routine watchkeeping arrangements or contingencies in the event of an emergency.

With a reminder from the vendor that there were plenty of places to take shelter on the way, and with a final joke that with the wind strength as it was, they could probably make the voyage with just the cockpit spray hood up, they set off. Both were wearing their foul weather clothing, and their lifejackets, but at this stage had not put on their safety lines.

1.3.2 Voyage

Records obtained from the Southampton VTS radar system, show a yacht passing Hamble Point buoy at 1502, and proceeding into the West Solent. This was the only yacht in the area at around this time. At 1520, the vessel left the area of radar coverage as it passed the West Lepe buoy making a speed of 9.8 knots.

Pastime's passage through the Solent was later described as 'lively', with both the delivery skipper and the owner feeling seasick if they went below, due to the uncomfortable movement of the yacht. At this time, the cover had been removed from the main sail, but the main sail had not been hoisted. A small jib was in use, which was rigged to the self-tacking system. The engine was running and in gear at about 75% throttle setting.

At 1730, the delivery skipper was below planning the route to Plymouth. He marked a position on the chart which showed *Pastime* to be off Yarmouth. He then returned to the cockpit and discussed with the owner how the night watches were going to be manned. As they both felt seasick when they went below, they agreed that they would try and spend the night in the cockpit and take time to get some sleep in the open air.

As *Pastime* left the shelter of the Solent and entered the English Channel, the wind force slowly increased. As the yacht moved further offshore, the sea state worsened. However, *Pastime* appeared to be coping with the deteriorating conditions, and the cockpit remained dry. As the yacht motion increased, the skipper suggested that the owner put his safety line on. This he did, and clipped the free end to a strong point below the tiller.

The owner spent most of his time steering the yacht. Although the compass was ahead of him at the top of the companionway, it was too far away to be seen clearly, so he steered by watching the wind vane at the top of the mast. This meant that he kept the wind in the same relative position. Whenever the skipper took over the helm, he tried to steer a compass course. Because the compass card was difficult to see, it was not always possible for him to maintain a steady heading in this way, and the yacht was broached a couple of times.

The timing of events now becomes unclear, since there is no independent record. Approximately 30 minutes after passing the Needles, an alarm sounded from the engine control panel. This was an engine overheat alarm, and the engine was shut down. Boat speed slowed to about 6.5 knots, but it was decided to keep going. The next incident,

again about 30 minutes later, was a tinkling noise, and the pin holding the bar mounting the main sheet traveller fell onto the floor of the cockpit. This left the boom swinging free. However, without the sail set, this was controlled relatively easily, and the pin was quickly found and replaced in its mounting.

Night had now fallen, and the navigation lights were switched on. However, after encountering a large wave, the bow-mounted, combined port and starboard sidelight lantern failed. Subsequent investigation by the MAIB revealed this was probably due to water ingress into the lamp unit. Less than 15 minutes later, all the lights went off. (The two events are not connected and the power failure is discussed in detail in Section 2.8.) The skipper went to the cabin and, by trial and error manipulation of the battery changeover switch and the switches on the distribution panel, managed to restore the electrical power. This process resulted in the lights going on, then off, several times, until they came on and stayed on. No audible alarm was heard from the distribution panel.

There followed an interval of a little over 2 hours, during which time the lights, instruments and GPS were all working. This all came to an end when the lights and the instruments all failed again. The skipper again tried to restore power, but this time was unsuccessful. The only lights available in the yacht were a dim indicator lamp on the compass, and the dial light on the VHF radio. The hand-held GPS that had been provided by the vendors was then switched on. Unfortunately, it could not lock on and was therefore unable to display the yacht's position (see Section 2.9.1).

It was now about 2245, and the owner had been steering continuously since *Pastime* had left the Hamble, with the exception of only a couple of short spells when the skipper had taken over. By then he was tiring, so he asked the skipper to take over the steering. The skipper agreed, and they both sat on the port side of the cockpit **(see Figure 2)**, with the skipper at the helm forward of the owner. The owner tried to make himself comfortable in the port aft corner of the cockpit, and started to doze.

Some time later, he was awoken by a shout, and then became aware of the skipper's body hitting him, and passing over the top of him before going overboard. The skipper's body struck the owner's head as it went overboard, and he blacked out for a few seconds. When he regained consciousness, the owner realised that he was alone on the yacht, his lifejacket had inflated, and his hair was wet. He looked astern and saw a light in the water about 40 metres away, which he assumed to be the lights on the skipper's lifejacket. The owner threw the rescue horseshoe towards this light and saw the attached marker-light working. He then tried to turn the yacht back towards the skipper but, because of the wind speed and direction, and the sea state, he could not achieve this. He then tried to start the engine, but this was impossible because there was insufficient power in the batteries to turn the engine over. Recalling the formal training that he had received some 20 years previously, he realised that he had to get help. There was enough power left in the batteries to power the VHF radio, and at 2338, he managed to raise Portland Coastguard. Because: the owner had not been navigating prior to the accident; the GPS was not working; and there was no light available to see the chart, he was unable to give the Coastguard *Pastime's* position.

There was just enough power in the batteries to allow four transmissions. This was sufficient for his radio signal to be triangulated by the Coastguard using VHF DF, and to provide an approximate position which, combined with the information on courses and speeds, and time passing the Needles, provided good datum for the resulting search and rescue operation. The Coastguard transmitted a "Mayday Relay" message which

Figure 2

The cockpit

was responded to by five merchant vessels. They also tasked the all weather lifeboats at Weymouth, Swanage and Yarmouth, and the Coastguard helicopter from Lee-on-Solent to join the search.

Unaware of this activity, or how effective his call for help had been, the owner started to fire parachute flares at about 20-minute intervals. These flares were seen by the searching craft, and aided in his rescue. When operating the hand-held flares, he could not clearly see the instructions printed on the casing of the flare. This was partly due to the low light conditions, and partly due to not having his reading glasses available. Because of this, he burnt his hand on one flare and was unable to ignite two others, which he threw overboard.

The yacht was first seen at 0136 by the rescue helicopter, which then began to search upwind for the skipper. At 0147, Weymouth lifeboat was alongside the yacht, and started to assess the rescue options. The owner was subsequently taken ashore by lifeboat, suffering from shock and exhaustion.

The search concentrated on finding the skipper. His body was located at 0234 by the rescue helicopter, and at 0247 this was recovered to the Yarmouth Lifeboat. The skipper was wearing an inflated lifejacket, but not a lifeline or harness. All other units involved in the search and rescue operation were released at 0301. Weymouth lifeboat, followed by the Yarmouth lifeboat, returned to Weymouth where they were met by police and ambulance crews at 0418.

Pastime was eventually taken under tow by the tug *Kingston* and taken to Dartmouth. The yacht was discovered to be afloat, intact and upright with the foresail wrapped around the pulpit **(see Figure 3)**.

Figure 3

Yacht *Pastime* the following morning

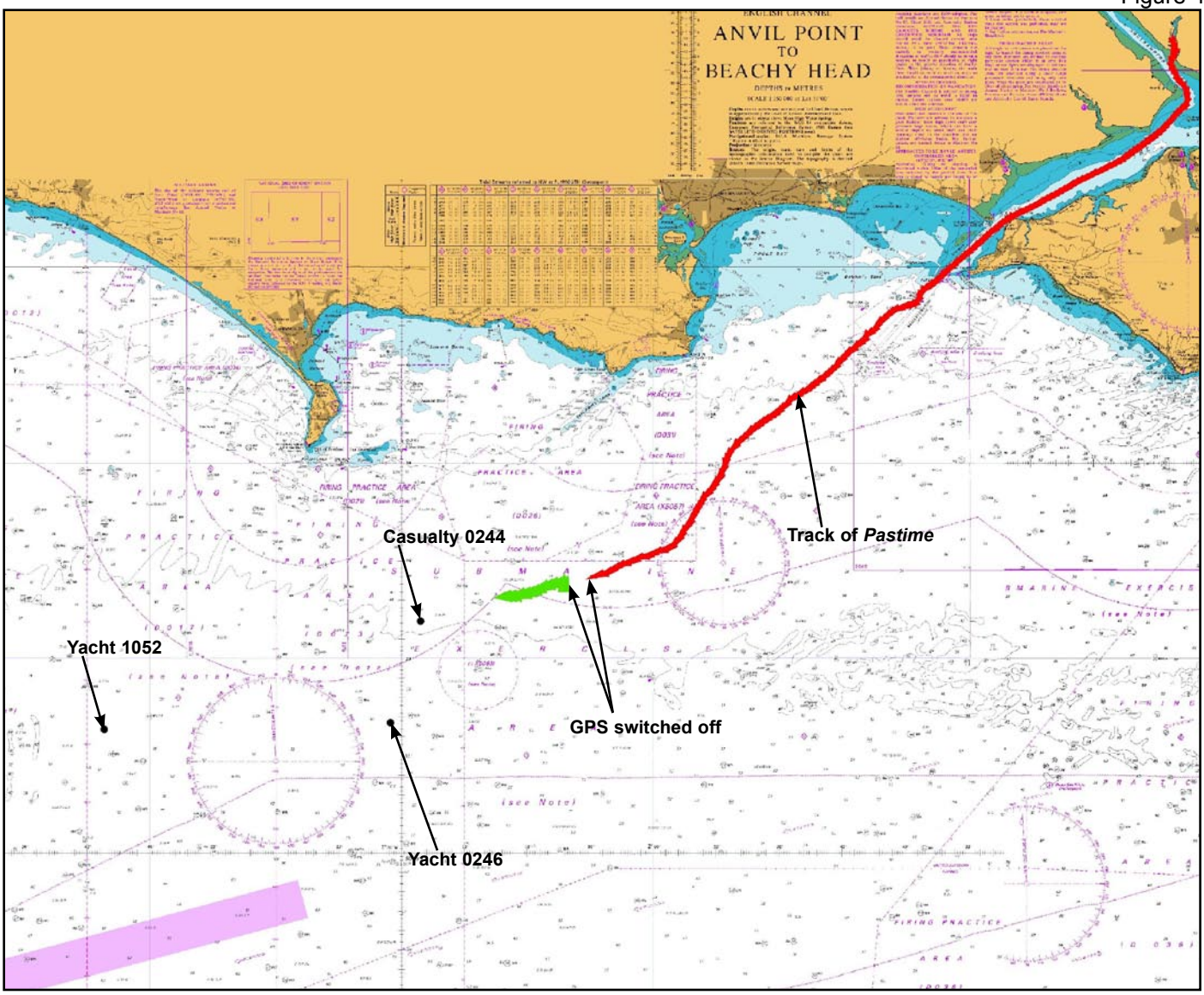
1.4 RECORDED DATA

Figure 4 shows the tracks downloaded from the GPS receiver on *Pastime*. The red and green tracks are two separate files found in the memory of the receiver during the MAIB investigation. They indicate that power to the unit was interrupted, as the record of positions is not continuous. It is unfortunate that the time recorded with the positions by the unit is the time interval between the recorded positions, and not UTC. It is not possible to determine the exact time at which the power went off and when it was restored, nor the time it finally failed. The estimated times extrapolated from this information support the witness's recollection of events, and support the timescales for electrical power reduction given in **Diagram 1** (see Section 2.8, page 30).

Also shown on the chart are positions for the yacht and the casualty, taken from the coastguard incident report. The times shown are the times these positions were reported; they have no other significance.

Composit of BA Chart 2615, 2450 and 2045 reproduced by permission of the controller of HMSO and the UK Hydrographic Office

Figure 4



Download from GPS showing track of *Pastime*

1.5 ENVIRONMENTAL CONDITIONS

The following times are for the day of the accident.

Ephemera	Time (UTC)
Sunset	1816
Sunrise	0616
HW Portsmouth (17th)	1245
Tide turn at Needles	1715 (approx)
Sea Water Temperature	7ºC

1.5.1 Weather forecasts

At 0505 on Friday 17 March, the Met Office issued the following weather forecast:

There are warnings of Gales in Portland, Wight, Plymouth, Biscay, Fitzroy, Sole, Fastnet and Shannon.

The area forecast for the next 24 hours….

Humber, Thames, Dover Wight:

East or North east 5 to 7, perhaps gale 8 later in Wight. Wintry showers, moderate or good

Portland Plymouth Biscay

East 6 to gale 8. Showers, moderate or good

The Inshore Waters Forecast issued at 0500 that morning gave the following:

Selsey Bill to Lyme Regis

24 hour forecast

Wind east or north east 5 to 7

Weather scattered wintry showers

Visibility moderate or good

Sea state rough,

Outlook for the following 24 hours

Wind east or northeast 6 or 7 occasionally gale 8 around exposed headlands

Weather mainly fair

Visibility mainly good

Sea State rough.

By 1130, the forecast had been amended. The gale warnings remained in force for the same areas, but the area forecast had changed and now read:

Wight Portland Plymouth

East or Northeast 6 to gale 8. Isolated showers. Moderate or good.

This forecast was re-issued at 1735 with no change.

At 1700, the Inshore Waters Forecast was updated and issued. It stated:

Selsey Bill to Lyme Regis

24 hour forecast

Wind east or north east 5 to 7

Weather isolated showers, mainly fair.

Visibility moderate or good

Sea state moderate to rough.

Outlook for the following 24 hours

Wind east or northeast 5 to 7

Weather mainly fair

Visibility good

Sea state moderate or rough

At the time of the rescue, *Pastime* was 16 miles offshore, so was out of the range of the Inshore Waters forecast area which extends to 12 miles off the coast. The weather in the area at the time of the search and rescue operation was noted by the coastguard as: wind from 080º at 25 – 30 knots (force 6 – 7) gusting 40 knots (force 8), overcast with good visibility.

1.6 QUALIFICATIONS

Pastime was a pleasure vessel as defined in the Merchant Shipping (Small Commercial Vessels and Pilot Boats) Regulations 2004. However, a delivery skipper had been hired for the voyage by the vendor as part of the sale, so the voyage was a commercial operation.

The Small Vessel and Pilot Boat Code of Practice (MGN 280) has been produced by the MCA to harmonise and rationalise existing small vessel codes. Its primary aim is to set standards of safety and protection for all on board, and particularly for those who are trainees or passengers.

The manning and qualifications required under the Code, for the different categories of water, are given at **Table 1**. From this, it can be seen that for a voyage in Category 2 waters, the skipper would require an MCA-accepted (also called commercial endorsed) Yachtmaster Offshore Certificate of Competency, and there should be an experienced second person on board identified by the skipper. The delivery skipper's qualifications (see Section 1.2 of this report) met these requirements, and there was a second person on board.

The system for granting commercial endorsements for leisure-based certification is currently under review by the MCA to bring the qualification requirements into line with the requirements of STCW 95 and the European Union. The revised system will impose additional requirements for candidates who wish to operate in more specialist areas such as passenger operations, towing and pushing, oil cargoes and fast craft.

CATEGORY	AREA	SKIPPER QUALIFICATION	MATE QUALIFICATION	MEDICAL REQUIRED
0	Worldwide	MCA accepted Yachtmaster Ocean Certificate of Competency	MCA Accepted Yachtmaster Offshore	ENG 1
1	Up to 150M from a safe haven	MCA accepted Yachtmaster Offshore Certificate of Competency	MCA accepted Coastal Skipper	ENG 1
2	Up to 60M from a safe haven	MCA accepted Yachtmaster Offshore, or MCA Boatmasters Liscence Grade 1, 2 or Modified Grade 3	An Experienced person as identified by the skipper	ML 5 or ENG 1
3	Up to 20M from a safe haven	MCA accepted Coastal Skipper, or Advanced Powerboat certificate of competency, or a certificate of competence for appropriate area issued by a Competent Authority	A second person capable of assisting the skipper in an emergency	ML 5 or ENG 1
4	Up to 20M from a safe haven in favourable weather and daylight hours	As for Category 3 waters	A second person capable of assisting the skipper in an emergency	ML 5 or ENG 1
5	Up to 20M from a safe haven in fine weather and daylight hours	MCA accepted Coastal Skipper Certificate of Competency, or MCA Boatmaster 3, or Advanced powerboat Certificate (2 years relevant experience, or Mca accepted Day Skipper theory and Practical	A second person capable of assisting the skipper in an emergency	ML 5 or ENG 1
6	Within 3M of a nominated departure point in favourable weather and daylight hours	MCA Accepted Coastal skipper Certificate of Competency, or MCA Boatmaster 3, or Advanced Powerboat certificate (12 months relevant experience), or Powerboat level 2 (12 months relevany experience), or MCA accepted Day Skipper Practical.	A second person capable of assisting the skipper in an emergency	ML 5 or ENG 1

Table 1

Manning and Qualification Requirements under Small Vessel Code

1.7 THE YACHT *PASTIME*

Pastime was a Maxi 909 FC yacht built in Sweden **(see Figure 5)**. The Maxi yacht range is designed to combine sailing performance with roomy accommodation, aimed mainly at the family cruising market. They are designed to cope with the weather conditions likely to be encountered during a coastal voyage.

Figure 5

Yacht *Pastime*

1.7.1 History

Pastime was imported to the UK from the Swedish manufacturers in 1990 by the then UK distributors of the Maxi yacht range. The yacht was sold to the first owners and entered onto the Small Ships Register. From March 1998, until she was sold in November 2005, the yacht was offered for charter. This necessitated a few changes to her fittings and equipment. All the rigging was labelled, the lockers containing safety gear were labelled, and a second battery was added to provide the domestic power. A crossover switch between the engine and domestic batteries was fitted, such that, in an emergency, the engine could be started using the domestic battery (see Section 1.7.4).

The yacht was kept in Dartmouth, and was well maintained, with defects corrected promptly and mechanical maintenance carried out using local tradesmen. Eventually she was offered for sale in Dartmouth, and advertised on the Internet, where the new owner first saw her. At the time, he was looking to buy a new boat, so did not try to purchase it. In the Autumn of 2005, the then owner decided to sell the yacht to brokers in Hamble. The previous owner realised there were two major jobs that needed completing before the vessel was offered for sale: the windows were leaking slightly, so were replaced; and the standing rigging for the mast was ageing, so this was also replaced.

The yacht was taken to Hamble in October, and the brokers put her ashore at their offices in the marina at Port Hamble. A structural survey was carried out for the brokers on 19 November 2005, to confirm the condition of the yacht. As she was being stored ashore, the engine was winterised according to the manufacturers' instructions. It was at the brokers' offices in Hamble that the new owner saw *Pastime* again and decided to buy her.

1.7.2 Hull and rigging

The structural survey carried out for the brokers on 19 November 2005, was assigned to the new owner on 27 January 2006. The survey concluded that this yacht was in overall sound structural condition.

The survey did not look at the rigging, but the previous owner had had the standing rigging replaced as part of the preparations for the sale of the yacht.

1.7.3 Engine and sail-drive unit

Pastime was fitted with a Volvo Penta 2002 series, 2 cylinder diesel engine driving a reversing 120S sail-drive unit incorporating a folding 2 bladed propeller. The engine developed 13kW (18hp) at a maximum engine speed of 3200rpm, and was located under the cockpit. Access to the engine was by the removal of the cockpit/cabin companionway.

The engine was started, stopped and monitored from a "Type A" instrument panel, with audible alarm located in a recess in the moulding of the starboard side of the cockpit. Instrumentation monitored lubricating oil pressure, cooling water temperature and battery charging status. If an operating parameter was exceeded, the appropriate warning light was illuminated and an alarm sounded **(see Figure 6)**. The alarm circuits could be checked by depressing the "Alarm Check" button.

An engine-mounted alternator charged both the domestic and engine starting batteries. There was no hand cranking starting facility fitted to the engine.

The engine was sea water cooled. The engine-driven sea water circulating pump drew sea water through the sail-drive unit via a 90º isolating ball valve fitted to the sail-drive housing. The cooling water passed around the engine and was discharged overboard through the engine exhaust system. There was no oil cooler fitted to this engine. Engine temperature was controlled by a thermostat. This started to open at 70ºC and was fully open at 87ºC, controlling the engine temperature between 75ºC to 90ºC. The cooling water high temperature alarm was set to activate at 97ºC.

Figure 6

Engine control panel

Externally, the engine and sail-drive unit were found to be in good overall condition during the post accident survey carried out for the MAIB. The systems were found generally leak-free, and the controls functioned as intended. There were some traces of rubber deposits on the face of the engine block and alternator fan. These originated from the alternator drive belt, and indicated previous belt slippage.

The engine was winterised[1] once the yacht was ashore at the brokers, and the brokers had purchased it. The company contracted to winterise *Pastime* offered four different levels of winterisation, with the brokers choosing level one, which was the most basic level available. At the same time as winterisation was carried out, a leaking engine rocker cover gasket was replaced. With the exception of the de-winterisation process, this was the extent of mechanical work carried out while she was ashore.

Pastime's engine was de-winterised at 0830 on the morning of 17 March 2006. On completion, the engine was turned over using the engine battery, the fuel system was purged of air, and the engine briefly fired up to prove functionality. It was not run again until the yacht was launched later that day.

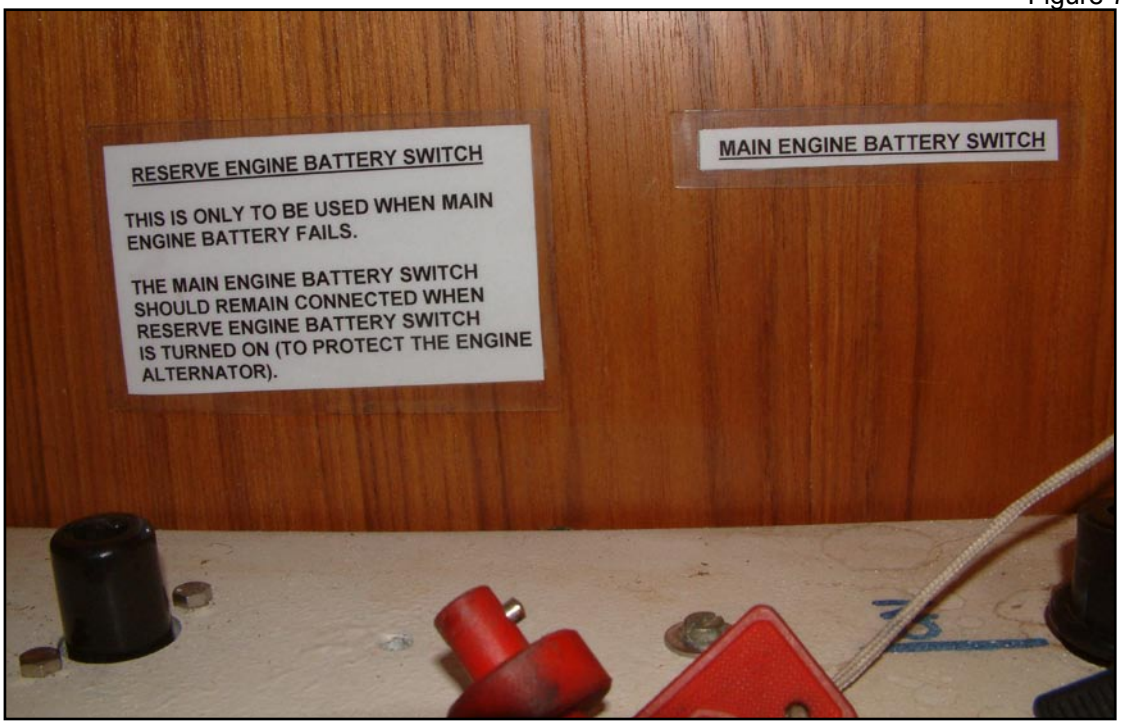
Very little work had been undertaken on the engine since it was first installed. A cracked cooling water pump cover had been replaced about 4 years prior to the accident, and a replacement starter motor, cooling pump impeller, and sail-drive hull seal had been fitted in 2005. The previous owner had carried out the routine maintenance specified in the engine owner's manual.

[1] This is the process of preserving an engine when out of use.

1.7.4 Electrical installation

Pastime was fitted with a 12 volt, negative earth electrical system. On build, she was provided with a single 12 volt battery, which supplied both the domestic and the engine starting power requirements. When first offered as a charter boat in 1998, the pre-charter role survey required that a second 12 volt battery be fitted to split the engine starting and domestic power sources. The engine battery was rated at 85 amp hours, and the domestic battery at 75 amp hours. The batteries could be cross-connected through an isolating switch to enable the domestic battery to be used for engine start in an emergency. This switch was normally left in the open, i.e isolating position. The engine battery could be disconnected from the engine starting motor, also by an isolating switch. Both the isolating and cross-connection switches were located in the battery compartment below the chart table, and were clearly labelled **(see Figure 7)**. Both batteries were charged from the engine-driven alternator through a battery isolating relay.

Figure 7



Battery changeover labelling

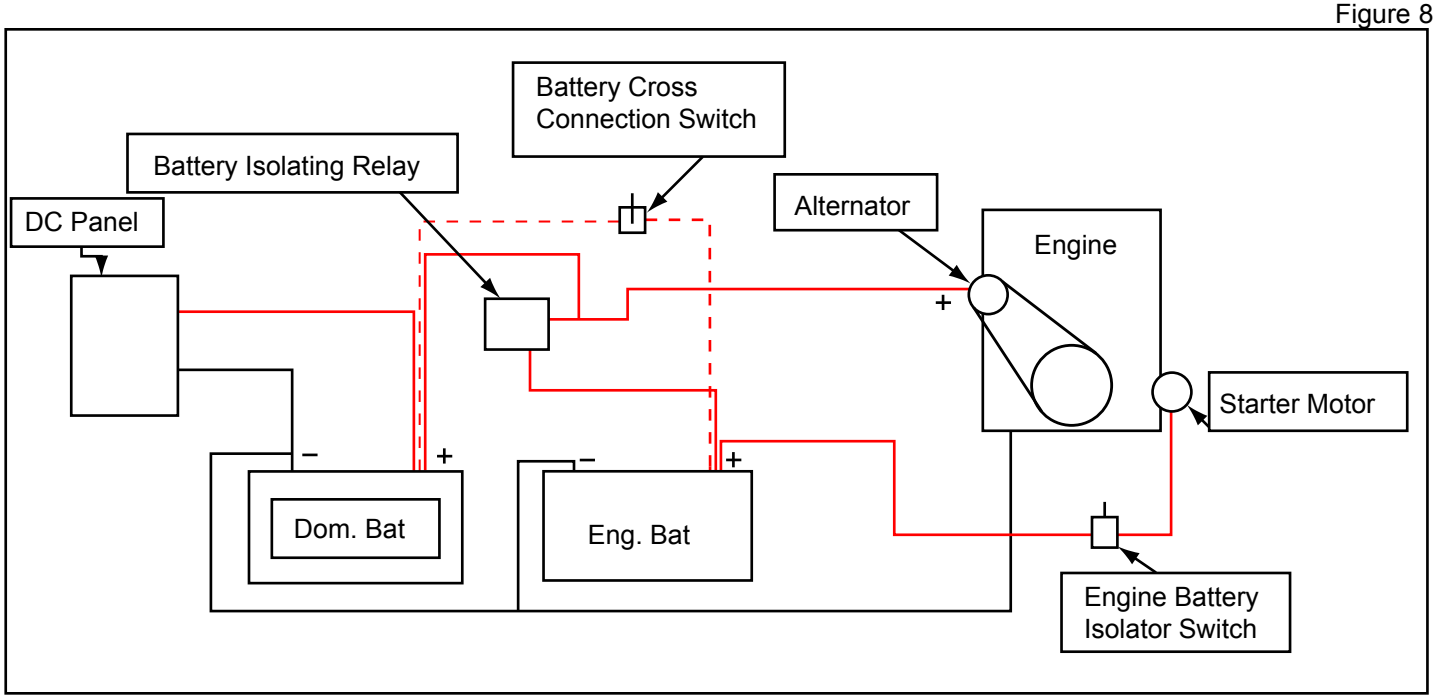
An electrical shore power type cable was fitted in the recess housing the engine control panel. At the free end, it was fitted with a waterproof connection to fit the supply boxes commonly found in marinas in the UK. The inboard end was not connected to any of the boat's services, and terminated in a square pin socket block. The cable was provided to enable 240 volt equipment to be used on board.

A schematic of the electrical circuit is at **Figure 8**.

Domestic power was distributed from the Swedish manufactured, Autobat-M 41521 model switch panel, situated above the chart table. To activate the individual circuits, the panel's ON/OFF switch was pulled out to the ON position. The START button was then pulled out to energise the panel's low voltage trip protection device. In so doing, the adjacent LED changed from red to green. With the distribution panel now live, the individual circuit pull switches could be operated to activate the appropriate consumer

unit. During the initial examination of the distribution panel at Dartmouth, a spectacle cord, belonging to the delivery skipper, was found to have been wound around the ON/OFF, START and INSTRUMENT LIGHT push button switches **(see Figure 9)**. The significance of this is discussed in Section 2.8.

Figure 8



Pastime's electrical circuit diagram

Figure 9

Distribution panel showing spectable cord overriding switches

The distribution panel incorporated a low level voltage protection system which was designed to trip the distribution panel and isolate the battery power supply, and hence electrical services, when the battery voltage dropped below 10.5 volts. When the trip operated, the LED adjacent to the START button changed from green to red, and the START button retracted to the "off" position. At the same time, an audible alarm in the distribution panel should have sounded[2], to alert the crew of the fault condition. Each of the individual circuits was protected by an 8 amp over-current circuit breaker located in the distribution panel. The distribution panel as a whole was fitted with a 25 amp, over current protection device.

The brokers had not requested that the domestic or engine start batteries be removed from the yacht for storage, an option available as part of the winterisation procedures. The batteries remained connected throughout the lay-up period. On 15 March, the owner requested that the brokers ensure that the batteries were fully charged prior to putting *Pastime* back into the water. Arrangements were subsequently made to charge the batteries overnight on 16/17 March. No other electrical system re-commissioning was undertaken.

With the exception of the paraffin heater terminal blocks, which were rusty, the electrical circuit wiring was found to be in good condition overall. There were no visible signs of circuit overload or burning to suggest any significant system defects. With the exception of a faulty cabin lighting circuit and bow light, the circuits were found to be fully functional.

1.7.5 Independent reports

The initial MAIB investigation indicated that there was a need for further independent investigative work to be carried out. Marine system specialists, DMQ Projects of Dartmouth, were commissioned to conduct a detailed survey of the electrical system, and to establish why the engine overheated during the evening of 17 March.

1.7.6 Electrical system

DMQ Projects carried out two surveys, and the resulting reports' main conclusions were that the:

- Battery cross-connection switch was defective, resulting in both batteries being permanently connected.
- Low voltage protection device could be "gagged" to continue the power supply, even in the event of fault condition.
- Domestic battery was severely degraded, had suffered from plate sulphation and could only retain its charge for 1 hour 15 minutes. The engine starting battery was in a slightly better condition, but only retained its charge for 1 hour 21 minutes **(Diagram 1** (see Section 2.8, page 30)**)**.
- Distribution panel low voltage audible alarm buzzer had been intentionally disconnected.

[2] Following an electrical survey in April 2005 the alarm buzzer was found to be defective and was replaced.

1.7.7 Engine overheating

DMQ Projects conducted an extensive survey of the yacht's engine, and although the results were inconclusive, the report determined that:

- There was evidence of scale build-up on the engine cooling passages and on the thermostat which could affect the heat transfer rate and operation of the thermostat.
- The cooling water high temperature warning probe was outside the operating tolerances.

1.7.8 Life saving appliances and safety gear

*Pastime'*s owner purchased a number of items of safety gear on the morning that the yacht sailed, as well as bringing some gear with him. In addition to lifejackets and foul weather clothing, he purchased six safety lines, having bought them in the weeks since the yacht was purchased, and a pair of bolt croppers.

The yacht was equipped with a horseshoe lifebuoy fitted to the pushpit on the port side aft. It had a self-igniting light attached, which was stowed upside down and, when turned the right way up, would light. During the checks of the yacht carried out before sailing, the owner tried this light, and found that it did not work. He dismantled it, and fixed the problem.

As part of the service to the skipper, the vendors placed on board a valise liferaft, which they had borrowed from a nearby charter boat company. It was clearly marked as due for survey in September 2005.

Also carried on board was a set of distress flares, which had an expiry date of December 2006. The set included: red parachute flares, red hand-held flares and two orange smoke floats.

1.8 PRE-PURCHASE SURVEY

A structural survey of *Pastime* was carried out for the vendors on 19 November 2005, by a specialist yacht surveyor. This was not a full survey and was designed only to assist in making a provisional valuation of the yacht. The survey did not incorporate an inspection of the engine, sails, navigational equipment, electronics/electrical equipment, or safety and lifesaving equipment.

In the resultant report, the surveyor used a system of stars to indicate the severity of any defect discovered. Their relative importance or urgency was defined as follows:

★★★	URGENT	Structural or safety defects or omissions affecting the safety of the vessel and/or crew, and which require immediate attention, unless otherwise indicated.
★★	PRIORITY	Defects which could lead to structural or equipment deterioration or affect the safety of the crew if not attended to in the near future, but which do not present an immediate threat to the crew or vessel.
★	COSMETIC	Items requiring basic attention to enhance the cosmetic appearance of the vessel and/or her fixtures or fittings, and perhaps to enhance her value. It should be noted, however, that these observations are to some extent a matter of opinion, and alternatives may perhaps be considered.

There were no 1 or 3 star defects noted in the report, but there were five 2 star defects. Two of the 2 star defects were nominally outside the scope of the survey. The third item concerned stress cracking at the base of the stanchions, and the fourth concerned refitting a bolt, nut and washer on the port side after pushpit stanchion. The final item was for the engine cooling water inlet valve to be serviced as soon as practicable. This had been found very stiff to turn.

The conclusion to the report read in part:

> *Pastime was found to be overall in sound structural condition, as determined by standard non-destructive testing methods, and very good cosmetically, and it is evident that she has been the subject of a high level of ongoing maintenance, care and attention since commissioning.*

No further survey was carried out on *Pastime* before she was sold.

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 FATIGUE

The owner and skipper's sleep and work patterns for the 48 hours leading up to the accident were analysed using the MAIB Fatigue Investigation Tool. This software has been developed to determine the likelihood of fatigue-induced mistakes causing an accident.

The result of the fatigue analysis was broadly similar for both men. There was no indication of a possible long term fatigue problem, though it is probable that their performance was degraded to some degree. This would have affected their operational and decision-making capability. The analysis included the fact that both men had been seasick.

2.3 THE ACCIDENT

It is probable that, had the skipper been wearing a safety line and harness, he would not have fallen overboard. That still leaves the question of how the skipper managed to fall overboard, from his fairly deep and protected cockpit, on a yacht that was mostly upright. To fall over the side, the skipper could not have been fully seated, as his centre of gravity would have needed to be higher in order for him to topple over the guardrail. One possible scenario for his falling overboard, that fits the known facts, is as follows.

As the yacht was sailing downwind on the starboard tack (ie with the sail out to port), and with the helmsman sitting on the port side, weather helm would require the tiller to be pushed away from the helmsman. If the yacht started to broach, it would have altered course to starboard, and probably heel to port. The helmsman would now be pushing the tiller away from him and "uphill" to try and regain his heading. If the heel was large, this might have required him to lift slightly from his seated position. Once the broaching wave had passed, and the yacht began to right itself, the helmsman would have then been off balance, and would have fallen to starboard, in a crouched position. If the yacht was then hit by a larger wave from starboard, this could have moved her quickly to port, pitching the helmsman out of the boat.

What is known is that *Pastime* had broached previously during the voyage, the owner woke to a shout and was aware of the skipper passing over him. The owner blacked out for a few seconds, but when he regained consciousness, he discovered his hair was wet and his lifejacket had inflated, indicating that a wave had come on board.

2.3.1 Survival times

The delivery skipper was appropriately dressed for the weather conditions, but not for immersion in water. His foul weather clothing, while keeping the rain and spray out, would not have prevented the ingress of water to his other clothing. The water temperature was 7ºC.

The IAMSAR Manual Volume 3, Section 3 gives a guide to survival time for a person wearing no special protective clothing, in water of varying temperatures. This indicates that, when immersed in water which ranges in temperature from 4ºC to 10ºC, the expected time of survival is “less than 3 hours”. The owner made his initial call to the coastguard at 2338, and the skipper’s body was recovered to the Yarmouth Lifeboat at 0251. This period of 3 hours and 13 minutes is at the limit of the survival time in this temperature of water.

In their book *Essentials of Sea Survival,* Frank Golden and Michael Tipton give a table showing the times of “useful” consciousness for individuals immersed in cold water in different clothing assemblies under laboratory conditions. For an individual wearing ordinary clothing, in water of 7ºC, the times of useful consciousness would be between 1¼ and 1¾ hours. The accompanying text states that this time would be reduced in turbulent water, and would be affected by the amount of body fat of the individual. For the delivery skipper, it could be assumed that, since he was slightly overweight, his time of useful consciousness would be nearer the upper limit, but because of the sea state, it would be lower. If it is assumed that his time was a median time of 1½ hours, this would still leave a further 1½ hours during which he could possibly have been recovered alive.

Also in this book, they discuss the use of lifejackets. Lifejacket buoyancy is mainly distributed over the front of the upper torso, to facilitate self-righting. The legs then act as a sea anchor, turning the body so that within one or two waves, an unconscious person will float facing the on-coming waves. In larger breaking waves, the narrow wave crest may, periodically, wash entirely over the wearer’s face. This phenomenon is known as “wave splash”. Repetitive wave splash will interfere with normal breathing. A conscious person can synchronise breathing with wave splash, but this becomes uncomfortable. A conscious person will soon learn to put their back to the waves. To maintain this position requires small swimming movements, and thus increases the rate of heat loss. An unconscious individual is more likely to drown due to wave splash than to succumb to hypothermia. The use of a spray guard, or hood fitted to the lifejacket, avoids the problem of having to synchronise breathing with wave splash **(see Figure 10)**.

The postmortem report gave the skipper’s cause of death as drowning. Whether this was due to a gasp reflex on entering the cold water causing him to breathe in water, or due to the effects of wave splash, will never be known. However, if we assume that the skipper survived the initial cold water shock, and lost consciousness some time later, had his lifejacket included a spray hood, his chances of rescue would have improved.

2.3.2 Pyrotechnics

Pastime carried a standard set of distress flares. This consisted of four parachute flares, six hand-held flares and two orange smoke floats. Problems were encountered in setting off the flares because the owner could not read the instructions clearly. It was dark, and he could not find his glasses. This was not the time to be reading the operating instructions for the first time, and although he could remember how to launch the parachute flares, he had more difficulty with the hand-held flares. He could not ignite two of them, and disposed of them overboard. He also sustained slight burns to his hands when setting off the flares.

2.3.3 Lifejackets

Both lifejackets were of a horseshoe type, designed for automatic and manual inflation. The skipper's lifejacket inflated on entry into the water, and the owner's inflated in the cockpit. Inflation of the owner's lifejacket was initiated by a dissolvable pill. This would have required only a relatively small amount of water to be spilled over the activation unit for the lifejacket to inflate. Other types of automatic inflation devices include those which are activated by hydrostatic pressure. These require the unit to reach a depth underwater before activating.

Because of the relatively small amount of water required as a minimum to initiate the inflation of the owner's lifejacket, it is not possible to estimate the amount of water which came on board. There is, therefore, no indication of the size of wave that washed on board.

Photograph courtesy of RNLI Figure 10

Typical spray hood - under evalualation by RNLI

2.4 YACHT DELIVERY QUALIFICATIONS AND TRAINING

The vendors, who arranged the services of the skipper for the delivery voyage, had confirmed that Mr Clear held appropriate qualifications, by sighting his certificates. Pursuant to their role as yachtbrokers, the vendors had a small number of skippers who they employed for yacht delivery, all of whom held RYA qualifications. They did not keep a record of their qualifications, since the manpower pool was small, and all the skippers had had their qualifications sighted. Their pool of skippers held various qualifications, and they would try to match qualification and experience to job. Thus, for a delivery in sight of land for the whole voyage, a coastal skipper qualification might be appropriate, but for a job taking a boat across an ocean it would not.

David Clear was recommended by vendors, and his fees were settled by them as part of the deal for the sale of the yacht. Having established that he was qualified for commercial operations of this type, the vendors included him in their small team of skippers to be called on to carry out delivery voyages when required.

It was the brokers' preferred practice to arrange for the previous and current owners to sail together on the delivery voyage, so that the yacht's specific characteristics could be properly explained. David Clear had sold his previous boat through the brokers, and had delivered it with the new owners. The brokers had been contacted by the previous owner of *Pastime* to see if she could help to deliver the yacht with the new owner. The proposal was declined by *Pastime*'s current owner, so David Clear was engaged as the delivery skipper.

Based on David Clear's experience and qualifications, there was no reason for the brokers to doubt his ability to carry out the delivery voyage. He had the qualifications to allow commercial operation for a voyage of this type, and this size of vessel. He owned a yacht of a similar size, and had a number of years' experience sailing in the area.

2.5 MANNING

As laid down in the Small Commercial Vessel and Pilot Boat Code of Practice, for this size of yacht, the requirement for commercial operation for a voyage in Area Category 2 (Up to 60 miles from a safe haven), would be for the skipper to hold an MCA Accepted Yachtmaster Offshore Certificate. Single-handed operation would not be allowed in this category of water, so a second person, deemed by the skipper to be experienced, would be required.

If one accepts the owner to be experienced, the manning of *Pastime* was in accordance with the requirements of the Small Vessel Code.

2.6 DECISION-MAKING

In any marine excursion, there are a number of decisions made which will ensure that the operation is carried out safely and expeditiously. To enable the decision to be made, certain information must be available and be carefully considered.

In this case, the first decision made was to launch the yacht and to sail. This was based initially on a provisional date when the tides would be favourable for an early afternoon start, when there would be a reasonable amount of daylight. A week before, the long

range weather forecast was deemed to be acceptable, with moderate to strong easterly winds, and the launch date was confirmed. Later, the 3-day forecast showed no appreciable change, and preparations for the launch continued.

Once the yacht had been launched, and was ready to depart from Hamble, the increasing wind conditions do not appear to have prompted any consideration of contingencies or delays to the voyage. The focus of the delivery skipper and the new owner appeared to be on completing the voyage as quickly as possible. Having sailed from Hamble, no reassessment of the conditions was made, nor were alternative destinations considered.

2.6.1 Influences and factors

There were a number of pressures acting on the owner to get the yacht to Plymouth that weekend. He had just bought a new yacht, and wanted to get it home. The voyage would be an ideal way of re-learning the skills of boating, while under the eye of an expert. It would also mean that he would get to know the yacht before later taking it out alone. As a semi-retired man, this yacht was going to take up most of his spare time, and he was keen to get started.

There were also a number of pressures acting on David Clear. As a CORGI registered plumber, his work depended on maintaining his CORGI registration. This was due to expire at the end of March, and he was required to re-sit his qualification. The last date he could start the course and be re-registered in time was 20 March. This was 3 days after the expected sailing date from Hamble. He therefore had to complete the voyage and return home before the course started. It was also the first time he had been a delivery skipper, so he would have been keen to complete his first job successfully. He would therefore have felt under pressure to start, continue and complete the voyage as expeditiously as possible.

The weather forecast was not ideal, but with the wind north of east, it would be astern of the yacht throughout the voyage, and allow for a reasonably comfortable passage. However, in the event, the passage took the yacht further off the coast than expected, and clear of the shelter of the land.

The time pressures to complete the voyage might have influenced the decision to sail in these conditions.

2.6.2 Passage planning and safe havens

Regulation 34 of SOLAS Chapter 5 requires, in part, all vessels that proceed to sea to plan their voyage. For small vessels and pleasure craft, the degree of voyage planning will depend on the size of vessel, its crew and the length of voyage. The MCA expects all mariners to make a careful assessment of any proposed voyage, taking into account all dangers of navigation, weather forecasts, tidal predictions and other relevant factors, including the competence of the crew. This guidance is endorsed by the RYA during its training courses, which both of the crew had undertaken.

It would therefore have been appropriate for the skipper to have prepared a plan before setting off. However, the plan was finalised as *Pastime* was proceeding down the Solent, and does not appear to have included much thought for alternative destinations, or refuges. As alternatives to carrying on past The Needles had not been considered, a positive decision to continue might not have been made.

The limited plan could be seen on the chart recovered from the yacht. The plan was indicated by a single line across the chart, with an Estimated Position (EP) marked on for a 4-hour interval, and GPS positions marked hourly. These positions did not lie on the planned track. By the time the 4 hours was reached, the EP and actual position were 7 miles apart. It would appear that no effort had been made to update the EP for the course and speed made good, and efforts to correct the course to regain the planned track were ineffective.

The navigational expertise displayed, shows a fairly rudimentary understanding of the principles involved. Good technique was followed in that the position was regularly plotted. However, after plotting each position, the EP should have been updated for the actual course and speed made good. This would have allowed the navigator to re-assess the heading to steer to maintain the planned track, and to assess his progress along it. In this case, *Pastime* was setting south away from the planned track, and no attempt was being made to counter this set and drift **(see Figure 11)**.

In practice, because of the state of fatigue, seasickness, and concerns about the lighting failures, it can be understood why full navigational techniques were not incorporated into the chart-plotting exercise.

Figure 11

The chart in use

2.7 NOT WEARING A SAFETY LINE

The delivery skipper was qualified by the RYA (see Section 1.5.1). To gain his qualification, he would have had to have undergone specific safety training, which would have highlighted the need to use safety lines in rough weather. It is known that he advised the owner to clip his safety line on, but did not do so himself. The question therefore has to be asked, why was the skipper not clipped on? His training advised it, his actions in telling the owner to clip his lifeline on showed that he was thinking about it, yet he still failed to do so.

Psychologically, there are two possible reasons to explain why he acted against his training:

- The first is that it was a habitual practice of his not to use a lifeline. But this can be discounted: other crews with whom he had sailed, including the new owners of his previous yacht, have all indicated that, when necessary, the skipper wore his safety line. It is also of note that he had brought his own safety line with him on the trip.
- The second, and more likely reason, was that his intention was to wear his safety line, but he became distracted at the time he was about to put it on, and thereafter forgot.

When one considers that the skipper was also navigating, and sorting out the electrical problems, as well as suffering from seasickness, the possibility of some distraction making him forget to put on his safety line was high. He would also have felt directly responsible for the owner's safety, and this could have provided a further source of distraction.

It is common practice when working below, to have one's personal safety line clipped to one's harness, and the tail of the safety line tucked behind the lifejacket or into the harness so that it doesn't catch on any fittings. Had the skipper put his safety line on in this fashion, when he instructed the owner to put his on, he would have been presented with a reminder to clip on every time he noticed the lifeline in front of him. This reminder was not available to him, and with the distractions, his mental checklist would have been completed since he had taken action about clipping on.

It would perhaps have been at this point that a more experienced crew member would have noticed that the skipper was not wearing a safety line, and would have reminded him to put one on. The owner, however, was steering and concentrating on the wind direction indicator at the top of the mast. Additionally, by that time, it was getting dark and he was suffering the effects of seasickness and fatigue. Even though the skipper had been up and down to the cabin several times, he did not notice that he had not clipped on.

The distractions of the mechanical and electrical problems, combined with the effects of seasickness and the mental demands of being in charge of *Pastime*, may explain why the skipper was not using his safety line.

2.8 MECHANICAL AND ELECTRICAL DEFECTS

2.8.1 Loss of electrical power

A well maintained and efficient electrical system is fundamental to the safe operation of any vessel. It is also essential that the skipper and crew have a thorough understanding of the system. Not only is the provision of adequate electrical power important from a navigation equipment perspective, but also for engine starting, especially in an emergency situation when personnel recovery may be necessary. In this case, there was insufficient electrical power to start the engine, and this denied the owner the option of starting and using the engine to manoeuvre *Pastime* in an attempt to recover the skipper. At the start of the yachting season, many of the yachting publications emphasise the need for comprehensive electrical and mechanical checks, especially for vessels which have been in lay up.

The owner was aware that it was important that the yacht's batteries were in good condition, especially as *Pastime* was about to go to sea after a lengthy lay up. He asked the vendor to ensure the batteries were fully charged before departure. On the evening of 16 March, the vendor's maintenance employee connected an electrical shore supply to the waterproof electrical connector on board *Pastime* (see Section 1.6). In doing so, he did not check that the connector led to an onboard battery charger, and that the batteries were being charged. In fact, the electrical cable which led from the connector did not supply power to any of the onboard systems, and the yacht's batteries did not receive any charge.

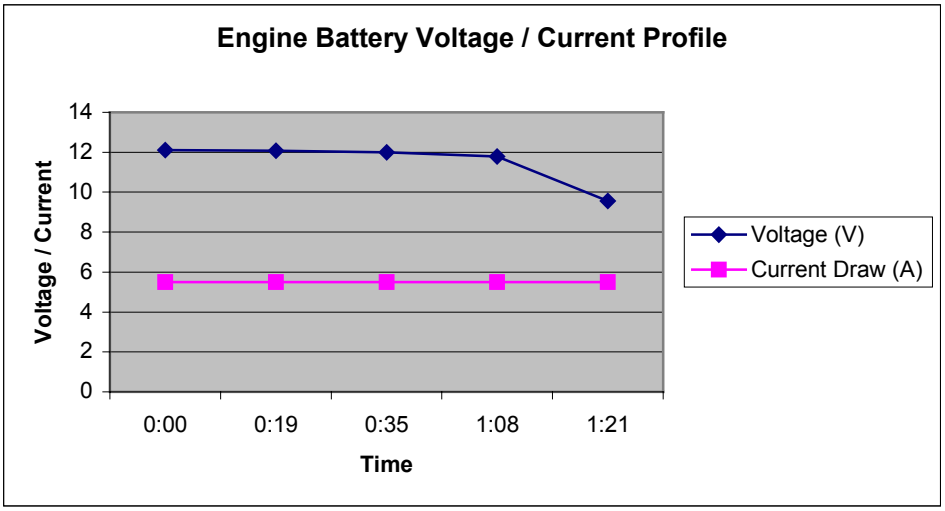
The vendors conducted no battery health checks. Because the engine had been turned over on the starter motor by the re-commissioning engineers, the vendors believed that the batteries were healthy and charged. The re-commissioning engineers were not requested to conduct any battery checks, other than to confirm that the engine would turn under battery power. *Pastime,* therefore entered the water with only the residual battery power remaining from the lay up. This was sufficient to start the engine and, once started, its alternator charged the batteries, and continued to do so until the engine overheated and was shut down.

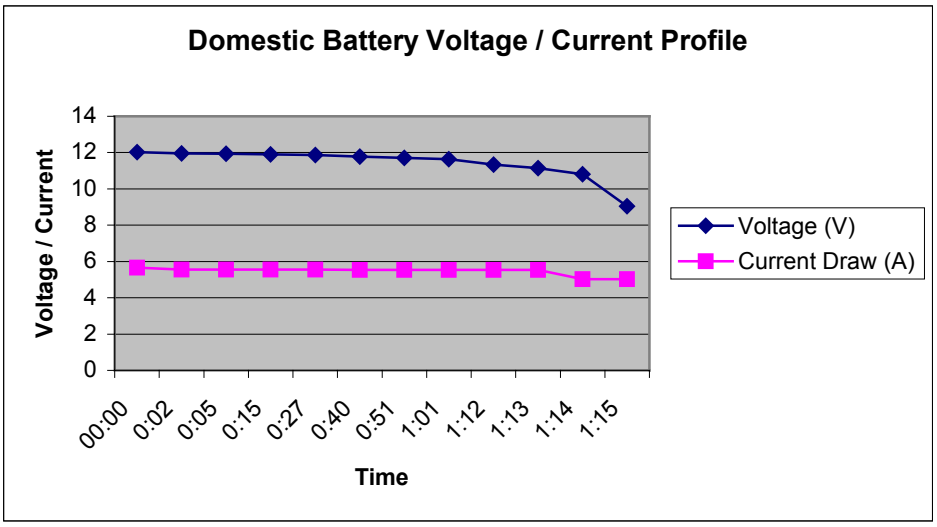
The independent report into the loss of electrical power identified that the battery cross-connection switch was defective, and that the two batteries were permanently connected in parallel. Because of this, any reduction in domestic battery power would have resulted in the engine starting battery power also being reduced.

It was also found that the domestic battery plate condition was very poor and had suffered from sulphation, rendering it incapable of maintaining its charge, and this was the cause of the power failure. Trials proved that the combined battery output would have lasted for only about 2 1/2 hours, based on the electrical equipment in use at the time. The battery voltage would have rapidly dropped off after that time, making it impossible to start the engine. The domestic and engine battery time/current/voltage trial profiles are shown at **Diagram 1**.

The owner could not recall the low voltage alarm sounding as the power was lost, suggesting that there might *not* have been a drop in battery voltage. This is dismissed because it was later found that the alarm had been disconnected. The first owner of *Pastime* had disconnected the low voltage alarm because of the loud noise it emitted when activated, which tended to disturb people on board and in adjacent boats in

Diagram 1





the marina, especially at night. Subsequent testing, after the alarm was reconnected, confirmed it to be functional, although it operated at 10.2 volts, slightly less than designed level.

A functional low voltage alarm would not have prevented the loss of power. However, it would have alerted the skipper and owner of a fault condition. Had they fully appreciated the meaning of the alarm, it would have given them the necessary prompt to recharge the batteries, having taken due account of the engine overheating problems.

While the skipper spent a short time familiarising himself with the electrical system before departure from the marina, he did not discuss the system or its operation with the owner or the vendors. It is not possible to ascertain the depth of his knowledge, or whether he consulted the documentation on board which described the operation of the distribution panel and associated alarms and protection devices. Although the skipper owned a similar yacht, the Maxi 1000, the electrical distribution system on board *Pastime* was significantly different in the method of isolation in the case of a low voltage situation.

As the battery voltage fell below 10.2 volts, the low voltage trip would have disconnected the distribution panel, and power to the services would have been lost. As the skipper was trying to rectify the problem, the owner reported that the lights were flickering on and off, until some time later, when they became steady. It is likely that the skipper was trying to energise the distribution panel. But in doing so, the low voltage was sensed by the protection device as the START switch was pulled, and the power would have been disconnected again.

Section 1.7.4 notes that the delivery skipper's spectacle cord was wound around the START switch. This would have artificially held the low voltage protection switch in the ON position to prevent it from operating, and thus keeping the onboard services live until they progressively failed as the voltage diminished. Luckily, there was just sufficient battery power left for the owner to alert the coastguard of the emergency situation once the skipper had been lost overboard.

The skipper of the tug *Kingston* reported that, on arrival at Dartmouth, he noticed that the battery cross-connection switch, and all the distribution switches, were in the ON position. This suggests that the skipper had attempted to supply the domestic services from the engine starting battery. The tug skipper measured the battery voltage to be less than 1 volt, which supported the evidence that the services had been left connected and the batteries allowed to drain down.

2.8.2 Overheating of the engine

The investigation into the cause of the engine overheating has been inconclusive. Prior to the accident, the engine had been run for about 15 hours at 75% power, during the trip from Dartmouth to Hamble, with no signs of overheating. During the independent investigation, the engine was run at 75% power, in forward gear for 2 1/2 hours, without any signs of overheating. It is possible that debris or flotsam might have temporarily blocked the sea inlet, causing a restriction to the flow of the engine's cooling water, causing it to overheat on the day of the accident.

Engines that are cooled by sea water are susceptible to scaling in the hot areas of the engine, i.e. the cylinder head and discharge overboard through the exhaust system. Severe scaling can dramatically affect the heat transfer rate to the sea water, and hence cause the engine to overheat. Some scaling was found in the thermostat housing, although this was not severe. However, examination of the cooling passage inside the cylinder head was outside the scope of this investigation. Further inspection in this area, especially as the cooling system has not been chemically-cleaned since installation 15 years ago, would be beneficial.

It is also possible that the discharge overboard could be partially blocked, reducing the throughput of the cooling water. During the MAIB tests, it was not possible to check the overboard discharge ports with the vessel in the water.

A correctly functioning thermostat is essential in regulating and maintaining the optimum engine temperature. Although the unit was found to operate within the manufacturer's threshold, it was fairly heavily scaled. It is possible that scale might have jammed the unit, degrading its ability to maintain the correct temperature until the scale became dislodged.

The cooling water high temperature probe was found to operate at 110ºC, which was outside its design parameter. While this would not have influenced the overheating condition, replacement of the unit would have restored confidence in the engine health monitoring equipment.

2.9 BUYING A SECOND-HAND BOAT

The RYA offers advice on buying a second-hand yacht, and this comes in two forms. Firstly, there is a pamphlet jointly published with the British Marine Federation (BMF) and the Association of Brokers and Yacht Agents (ABYA), which gives general guidance, and includes the advice to potential purchasers to have an independent survey carried out on the yacht before the sale is completed. Secondly, the RYA publishes a booklet covering the legal aspects of buying a second-hand boat. This also advises on the need for a full survey before purchase.

A broker will normally act as the market maker between buyer and seller. They are usually concerned with the condition of the yacht, but only so far as it makes the yacht saleable. The level of safety equipment that a yacht carries is at the owner's discretion, and for leisure yachts is not determined by statute. Advice is available from sources such as the RYA, RNLI and MCA, all of which will recommend minimum amounts of equipment to be carried. The brokers may well pass this on, but are not required to do so; in fact, their only obligation is to ensure that the contractual clauses in the sale agreement are met.

Good practice may dictate that the broker offers the same advice as the RYA, RNLI and MCA, and some brokers may offer this as a value added product for the buyer of a yacht. Most brokers do offer advice concerning survey and inspection of a boat before purchase, and offer an after sales service, which may include training, boat guardianage, as well as technical advice for racing or cruising. But this is a commercial decision, taken by the broker to expand his business, and there are no requirements for him to do so.

There are many sources of advice concerning the purchase and equipping of a second-hand boat. In this case, although there was sufficient safety equipment carried, the advice from any of the above sources, to have a full survey of the boat before purchase, and of having the engine overhauled before sailing, was not heeded.

2.10 EQUIPMENT PROVIDED BY THE VENDOR

The vendor of *Pastime* was, in fact, a yacht broker by profession. When selling on *Pastime* to her new owner, the vendor adhered to his usual practice of ensuring that there was a liferaft on board any boat that one of the skippers was required to deliver. *Pastime* was not fitted with a liferaft, so the vendor borrowed one from a yacht charter company which operated from the same marina. Notwithstanding the laudable intentions of the vendor, the liferaft which was supplied to *Pastime* was clearly marked as being 6 months overdue for servicing.

The vendor also loaned a hand-held GPS unit to the delivery skipper. The unit had not been used for approximately 18 months, so the vendor replaced the batteries, switched it on and explained its basic operation to the delivery skipper. The skipper appeared to

be content that he knew how to operate the equipment, which was provided as a back-up to the GPS receiver fitted to *Pastime.* Because of the pressing need to sail from the marina, in order to make a favourable tide through the Needles, the skipper did not take the time to verify that the hand-held GPS was displaying a correct position.

After the accident, the hand-held receiver was recovered from the yacht and sent to a specialist for evaluation. The conclusion to the resulting report is as follows:

> *Older GPS units of this era require an initial position to assist in obtaining a satellite fix. This is updated with the last received position when the unit is powered down. This and the received almanac are held in memory and enable the unit to predict the satellite orientation when next used and reduce the time to getting a fix. The fact that there was no initial position, the unit was requesting POSITION INITIALISE and the date was reset to 1980 – the default setting after a memory clear we can only conclude that a memory clear was carried out prior to our investigation of the unit. This in itself may not be either significant or have attached to it any ulterior motive. It is common practice and sound advice to perform a memory reset if a GPS receiver or Chart Plotter is not functioning correctly. Because of this there was no indication of either a date or position of last fix. However, we can confirm that the unit does appear to be faulty with very poor satellite reception.*

The fact that the vendor supplied these two items of equipment, shows that the crews' safety was being considered, even though the liferaft was out of date for service and the GPS was not working correctly. The time pressure to depart, and the fact that both these items of equipment were placed on board just before sailing, meant that their suitability was not properly assessed by the crew.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES

The following are the safety issues which have been identified as a result of the MAIB's investigation. They are not listed in order of priority, but in the order in which they appear in Section 2.

1. Fatigue and seasickness probably affected the crew's decision-making. [2.2]

2. The skipper was not wearing his lifeline. [2.3, 2.7]

3. A spray hood fitted to the skipper's lifejacket might have allowed him to survive long enough to be rescued. [2.3.1]

4. The owner could not read the instructions on the distress flares, and had to rely on his memory to be able to fire them. [2.3.2]

5. The passage plan did not include ports of refuge. [2.6]

6. The time pressures to complete the passage may have influenced the decision to sail in marginal conditions. [2.6.1]

7. The passage plan was not prepared before sailing. [2.6.2]

8. There were a number of causes distracting the skipper from putting on his safetyline. A more experienced crew member might have noticed and reminded the skipper to clip on. [2.7]

9. There was no battery charge or battery health check before sailing. [2.8.1]

10. The low voltage alarm on the electrical system had been disconnected. [2.8.1]

11. The low voltage electric isolation trips had been overridden. [2.8.1]

12. The cause of the engine overheating was inconclusive, but was probably the result of cooling water starvation caused by a temporary blockage of the water inlet, or corrosion produces within the system. [2.8.2]

13. The RYA advice to have the yacht surveyed and the engine overhauled was not followed. [2.9]

14. The time pressure to depart, and the fact that both the GPS and liferaft were placed on board just before sailing, meant that their suitability was not assessed. [2.10]

SECTION 4 - ACTION TAKEN

- The **MAIB** has:

  Prepared an article about this accident and the safety issues it highlighted, which has been distributed to the leisure industry through the yachting press.

- The **RNLI**, **RYA** and **YBDSA** are to:

  Promulgate the MAIB article detailed in **Appendix 1** to their membership.

Marine Accident Investigation Branch
September 2006

Appendix 1

Text for article on MAIB investigation into the death of a skipper

A man bought a second-hand boat from a company based in Hamble. Nothing unusual in this, except that he had not sailed for 15 years, and was returning to his old hobby. The new owner was aware that his skills were rusty, and when the company he bought the boat from offered him the services of a delivery skipper, he was happy to accept. He agreed to accompany the delivery skipper on the delivery voyage so that he could get used to the boat while under the guidance of an experienced man.

The boat had been stored ashore for the winter, and on a windy March morning was launched the day she was to be sailed to her new home in the West Country. The delivery skipper and the new owner had checked the boat over, fuelled and stored her, before sailing to catch the tide through the Needles Channel. The weather forecast was for force 5-7 from the east, and they set off motor sailing with just a small jib hoisted. Both men were wearing foul-weather clothing and lifejackets with safety harnesses.

The passage down the West Solent was uneventful, and the skipper used the comparative calm to plan the voyage. On passing The Needles, the skipper ensured that the owner put his safety line on and clipped to a strong point, but he did not attach his own. Half an hour later, the engine overheat alarm sounded and the engine was stopped. They continued under jib alone. Night had now fallen, and about an hour after the engine was stopped, the lights went off. The delivery skipper went below, and managed to restore power by overriding the low voltage trip on the electrical distribution panel. This was a temporary fix and lasted for a little under an hour until the power failed again, leaving only the indicator lights on the VHF radio and the compass illuminated.

Both men were now sat on the port side of the cockpit. The skipper was steering and the owner was sitting astern of him, dozing. The owner was startled by a shout, quickly followed by the skipper's body hitting him as he went overboard, knocking the owner out.

The owner came round, and found himself alone in the boat. He could see a light, which he realised was the skipper, about 40m astern, and he threw the horseshoe life buoy towards it. He then tried to turn the boat back towards the skipper, but due to the direction of wind and weather, and the sails he was carrying, he could not turn up-wind, so he tried to start the engine. With no battery power, this was impossible. Realising that he needed help, he tried to use his VHF radio. There was just enough power to allow three transmissions, which raised the alarm and allowed the coastguard to triangulate his position using VHF DF. The yacht and the owner were found 3 hours later, and shortly afterwards the skipper's body was recovered.

The MAIB investigation identified a number of safety issues which had a bearing on the outcome of this accident:

1. Safety Line - the distractions of the mechanical and electrical problems, combined with the effects of seasickness, must have all contributed to the skipper not using his safety line. The use of a safety line would have prevented his loss overboard.

2. Survey – The survey carried out for the company that sold the boat was reassigned to the new owner. This was not a full survey, and was designed only to assist in making a provisional valuation of the yacht. The survey did not incorporate an inspection of the engine, sails, navigational equipment, electronics/electrical equipment, or safety and lifesaving equipment.. A full survey before sailing might have highlighted the poor state of the batteries.

3. Electrical power – When the battery voltage dropped below 10.5 volts, an audible alarm should have sounded, but this alarm had been disconnected. The automatic low voltage trip did activate and cut the electrical power. It was this that the skipper overrode to provide some electrical power for a short period after the first power failure. With a better understanding of the power supply system, the operation of the low voltage trip might have provided an indication of the nature of the electrical problem.

4. Electrical system – There were two batteries fitted to the yacht, one for domestic services and one for engine starting. Both were charged from the engine alternator, and there was an isolating switch fitted between the two batteries. This was to allow emergency starting of the engine using the domestic battery. This isolating switch was of poor construction and badly fitted, which meant that it could remain in the on position, even if the switch was in the off position. This meant that the two batteries could be unknowingly connected in parallel, allowing a damaged battery to draw power from an undamaged battery, draining both.

5. Battery condition – In general, the condition of the batteries was poor, with the domestic battery holding charge for only about 1 ½ hours. Once the batteries were inadvertently left in parallel, the domestic battery soon drained the engine battery.