



Standard Safety

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ANCHORING – Special Edition



There have been a significant number of groundings, collisions and near miss incidents caused as a result of manoeuvring in an anchorage, dragging anchor or leaving it too late before heaving up an anchor in poor weather.

These incidents have resulted in the loss of lives, pollution, and costs running into tens of millions of dollars. Many notable incidents have been captured on international television and have commanded front-page news, allowing worldwide publicity exposure.

Over the past two and half years, the Standard Club has had 40 claims where anchoring has been a major contributing cause.

- 15 lost anchors
- 8 collisions whilst at anchor – dragging anchor or another vessel dragging anchor and colliding
- 4 groundings as a result of being at anchor
- 5 piracy attacks whilst at anchor
- 6 anchor chains fouled, 3 with other vessels at anchor
- 1 pollution incident
- 1 total loss /grounding

The total claim cost is \$12m.

Since the beginning 2007, more than 100 vessels of all types in the industry operated by a variety of managers, have been involved in a 'navigational' incident resulting in a collision or grounding. The majority were inevitably caused by human error, rather than equipment failure. Ships grounding as a result of poor anchoring practices are a part of those statistics.

Ships are continually anchoring in all locations, in all weathers, and in all states of wind and tide. So with such accumulated knowledge, why are anchoring accidents not a thing of the past? Anchoring is very much a controlled process. It's a procedure so often done that any person attaining command of a ship should have accumulated sufficient knowledge and experience to carry out an anchoring operation safely.

The evidence suggests that this knowledge is either not being accumulated or not passed on. Is this in fact another symptom of the crewing crisis?

The Master picks the time and position to anchor, which anchor and the amount of cable to be used. The equipment used is simple, visible, and easily inspected, maintained and surveyed. Only on the rare occasions of distress or emergency is an anchor suddenly let go in an uncontrolled manner.

In This Issue

- RECENT INCIDENTS
- BALLAST CONDITION
- ANCHORAGE AND HOLDING GROUND
- AMOUNT OF CABLE
- ANCHOR HOLDING POWER
- COMMERCIAL PRESSURE
- PLANNING
- ANCHOR WATCHES
- ANCHORING IN DEEP WATER
- WINDLASS MAINTENANCE
- SAFETY MANAGEMENT SYSTEM
- CONCLUSION

What factors should be considered in order to effect a safe anchoring?

- Planning and knowledge
- Picking a safe anchorage, based on water depth, swing room, holding ground, exposure to the weather, vessel density, designated anchorages
- Anchor types, windlass performance and maintenance
- Anchor watches
- Available bridge team
- Vessel's condition, when loaded or in ballast
- Does the vessel actually need to anchor?
In deep water, in poor weather, in congested anchorages or for security reasons, for example, does the vessel need to anchor at all? It could be safer to drift
- Adverse commercial pressures.



Recent Incidents

The following case studies have been drawn from reports made by industry bodies including MAIB, AMSB, CHIRP, Nautical Institute and one from a Standard Club claim.

Example 1 - Heavy weather grounding

The grounding of the 76,000 DWT bulk carrier *Pasha Bulker* off Newcastle, Australia was captured by the international press. The Australian Maritime Safety Bureau report published in May 2008 made a number of important points.

In May 2007, the one-year-old bulk carrier, in light ballast condition and ready to load coal, anchored 2.5 miles offshore, south of the Newcastle harbour entrance. The vessel was scheduled to berth in three weeks' time. The Master anchored with nine shackles in 35 metres of water in a designated anchorage where more than 50 vessels were also at anchor.

After two weeks of good weather, the wind strength increased from the south-east. The Master, on receiving a gale warning, paid out an additional shackle of cable. During that evening, a number of vessels left the anchorage and put to sea due to the worsening weather. A few hours later, the first of the remaining vessels started to drag anchor. The local Vessel Traffic Information Centre advised the vessels that were dragging anchor and, within 24 hours, more vessels had also put to sea, but 41 ships remained at anchor, enduring 40 knot winds and eight-metre high seas.

Early the following morning, the *Pasha Bulker* began dragging its anchor and the anchor was weighed. However, with the rapid rate of drift caused by the ship dragging its anchor, the vessel was only 1.2 miles from the shore. The Master attempted to turn the vessel away from the coast, but with such strong winds and the substantial windage area due to the ship being in ballast condition, the vessel was driven onto the beach, grounding onto the rocky shoreline and breaching the hull. At the time of the grounding, the average wind speed was recorded as approximately 40 knots.

The windlasses of three vessels in a similar situation all failed when attempting to weigh anchor, with one vessel cutting its cable when under considerable tension, and the other two managing to slip their cables. These vessels were fortunately able to pull away from the coast.

Two weeks later, the *Pasha Bulker* was refloated and later towed to a repair yard.

The designated anchorage area [of Newcastle harbour] is fully exposed to the weather. The Pilot Book states that: "...no anchorage off the port can be recommended as suitable for all weather use, a good fair weather anchorage can be found" and "a safe distance should be maintained with other vessels in case of anchors dragging. A good anchor watch should be maintained, engines should not be immobilised as weather conditions may deteriorate rapidly... Onshore winds can increase suddenly within the hour and swells can exceed 10 metres. During southerly weather, sea and swell can become confused. It is recommended that vessels weigh anchor until the weather moderates."

The advice contained is clear.

- Masters must take note of the advice contained in the pilot books/sailing directions
- Masters must place the safety of the vessel and its crew above commercial considerations
- Masters must be aware of possible dangerous situations developing and take early and effective action

Ballast condition

Often a contributing factor in anchoring incidents is the fact that the vessel is in ballast condition. On any size of vessel, when the vessel is in ballast condition, there is an appreciable increase in windage area. Apart from the additional forces imposed on the cable, the vessel will probably behave differently at anchor to when it is loaded. The *Pasha Bulker* AMSB Report grounding noted that the vessel had 22,000 tonnes of ballast on board, which was sufficient for good weather; however, the fore and aft peak ballast tanks were empty. The ballast was not sufficient to fully immerse the propeller, giving a mean draft of only 6.0 metres. In the heavy weather ballast condition, the vessel would have had a draft of 8.50 metres. This is significant to reduce forward slamming in heavy weather, increasing propeller immersion and, importantly, reducing windage. This could have made the vessel more manoeuvrable, and, in heavy weather, prevented potential slamming.

Lower wind forces on a ship due to reduced windage at deeper heavy weather ballast conditions can significantly improve the control of the vessel. When vessels are in ballast, the Master should consider taking maximum ballast with the onset of heavy weather, even if this means the vessel is no longer load ready.



Example 2 - Too close to shore - total loss

A well-found reefer vessel at anchor waiting for orders, in ballast condition close to the Spanish coast, dragged anchor in poor weather, with the wind gusting to 50 knots, ended aground on rocks and was declared a total constructive loss. Here, even with local knowledge, the vessel anchored only six cables from the shore on the pilot's 'instructions' in a designated anchorage. There was less than one hour from the time the officer on watch (OOW) confirmed that the anchor was dragging to the vessel being aground. The Master had even taken the precaution of having the main engine on immediate notice and on bridge control two hours before the vessel started to drag. However, due to the fact that the vessel was again in ballast, the rate that the vessel dragged its anchor and the close proximity of the shore allowed no time to react and redeem the situation. In this incident, the windlass hydraulics failed when trying to raise the anchor and the vessel grounded on rocks, with one shackle still on deck.

Apart from the local forecasts and the actual fact that the wind was gusting to 50 knots, the incidence and danger of strong onshore winds during the winter months was clearly pointed out in the pilot books.

The crew were lifted to safety by helicopter, and the vessel was declared a total constructive loss. The cost of wreck removal was over US\$10 million.

- Masters must take account of the prevailing weather conditions when anchored close to shore

Example 3 - Sea bed pipelines

An Aframax tanker in ballast dragged anchor and nearly caused catastrophic damage to a gas pipeline off the UK's east coast.

The vessel was dragging anchor and the Master was trying to recover the anchor cable in poor weather conditions when the windlass hydraulic motor suffered catastrophic failure and the anchor cable ran out to the bitter end. It was fortunate that no one was injured. After much effort, the crew were unable to slip the cable from the bitter end.

The vessel's anchor was caught on a gas pipeline for about 10 minutes before a wide yaw caused the flukes to free themselves. The vessel continued dragging until the anchor finally held as it rode over a shoal patch that was 2.5 miles off the lee shore. By good fortune, no injuries were sustained and no damage was caused by pollution, but the incident could have been catastrophic.

Prior to the incident, the windlass motor was reported to be fully operational and to have met all classification society requirements. Class made the comment that the anchoring equipment is not designed to hold a vessel off fully exposed coasts in rough weather. In such conditions, components may be damaged or lost owing to the high forces generated.

- Masters must check the proximity of sea bed pipelines and cables from up to date chart information before anchoring
- Masters must be aware of the limitations of the anchoring equipment

Example 4 - Dragging anchor - engine readiness

The UK MAIB made an investigation into the grounding of a small product tanker off the UK's south coast in 2002. The vessel was in ballast condition and was anchored, in good weather, about half a mile from the shore, with sufficient cable out in an acceptable anchorage that was exposed to strong south-easterly winds. The weather turned during the next day to south-easterly, with winds of 20 knots and gusts of up to 30 knots. The vessel dragged its anchor; the OOW did not notice initially that the vessel was dragging and when the OOW did notice, the main engine was not immediately started or placed on stand-by. When the Master arrived on the bridge, the main engine could not be made available in sufficient time to be effective.

In this case, the Master and chief engineer were both very experienced and accustomed to navigating in these waters.

The report considered that there was insufficient cable out for the prevailing weather conditions, depth of water and nature of the sea bed. The vessel dragged anchor at a very fast rate, estimated at over 1.5 knots, and no consideration was given to paying out additional cable or letting go another anchor. When the main engine was started, the vessel was already only 50 metres from the shore and the vessel ran aground, with considerable damage to the ship. It was later declared a total constructive loss.

It was less than 12 minutes from the time the Master was called to the bridge to the time the local coastguard was advised that the vessel was aground.

The rate of drift when dragging anchor can be alarming.

- Masters must take early action when close to the shore in poor weather
- When anchoring close to shore consider to have the main engines on standby
- Masters should ensure adequate anchor cable is used in the prevailing conditions

Safety Factors

The anchorage and holding ground

In planning the anchorage approach, the Master should consult with the charts and pilots books as to the suitability of the holding ground of the anchorage, and also with respect to traffic density and ship movements, available swing room, holding ground, protection from the weather, wind, tide and the length of time the vessel is expected to be at anchor.

Masters should not just accept the fact that 'the authorities' have directed the vessel to anchor in a particular designated anchorage. There are many designated anchorages that are unsuitable in certain conditions, particularly with the onset of heavy weather, closeness to the shoreline, traffic density, exposure to the weather, water depth and/or poor holding ground. If instructed to a designated anchorage, the Master must ascertain for himself that the anchorage is safe in the prevailing conditions. Masters should be prepared to inform the VTS or port authority that the designated anchorage is not suitable in the prevailing conditions.

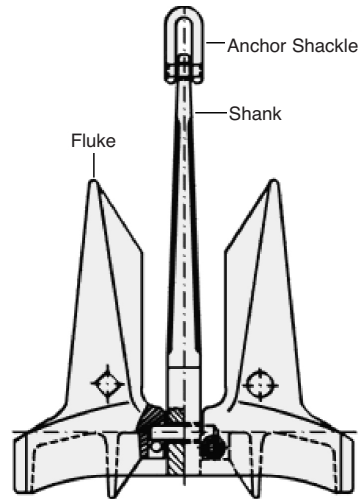


FIGURE 1: AC14-TYPE ANCHOR

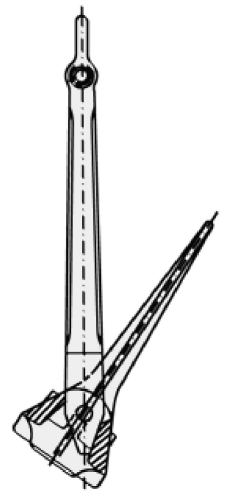
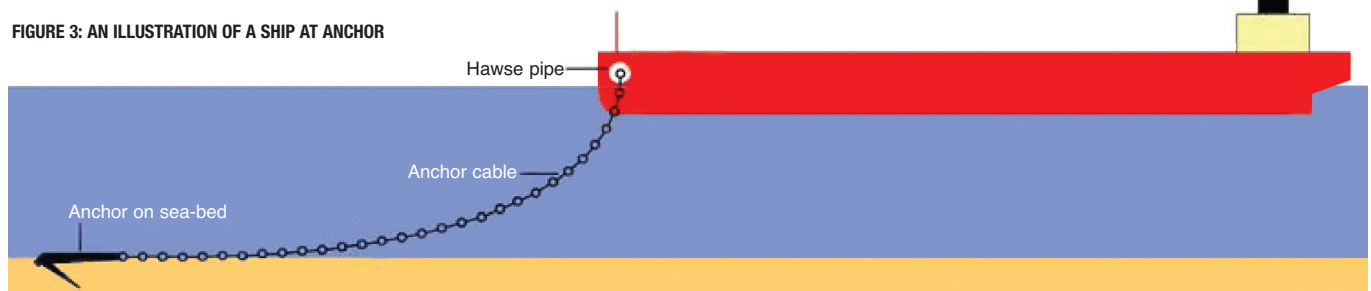


FIGURE 2: PROFILE OF ANCHOR

FIGURE 3: AN ILLUSTRATION OF A SHIP AT ANCHOR



Amount of cable

The *Pasha Bulker*, for example was fitted with a standard Admiralty Class AC14 cast steel high holding power (HHP) anchor. The cable was made from the highest-quality grade 3 steel.

For an anchor to hold affectively, it is necessary to calculate the correct length of cable. There are three commonly used and accepted guidelines (one shackle of cable is equivalent to 27.5 metres):

- 1) Number of shackles of cable = $1.5\sqrt{D}$ (D=Depth in metres)
- 2) Length of cables in metres = 6 to 10 x (Depth of water in metres)
- 3) For special steel cable, a formula of:

Length of cable used in metres = $39 \times \sqrt{D}$ – where D is the depth of water in metres.

The 'scope' of the cable is the ratio of the length of cable paid out to the depth of water. The correct scope of the anchor is important if the maximum holding power of the anchor is to be realised, particularly in heavy weather conditions. The anchor holds better when the cable is pulling horizontally to the anchor, and so the Master must be prepared to pay out extra cable when conditions such as increased seas, wind, current and tide require the cable pull to remain horizontal.

In addition to insufficient scope, there is significant yawing or heavy pitching, there is a risk that a snatched loading on the cable and anchor will be applied, and the anchor will be dislodged or will drag, and/or there will be windlass or cable failure.

For example, for a 10,000-15,000 dwt vessel in 20 metres of water, with good holding ground in sheltered waters, a 'scope' of five could be considered sufficient. Considerations of swinging room, whether the vessel is in ballast/loading condition and water depth should also be taken into account. In good weather, in a constrained anchorage with limited swing room and an expected short stay, less cable could be used; however, increased vigilance, with engines remaining on standby or immediately available should be considered, depending upon the circumstances.

Anchor holding power

As quoted in the AMSB *Pasha Bulker* report, the anchoring equipment is intended for temporarily mooring a vessel within a harbour or sheltered area when the vessel is waiting for a berth or tide, etc. The equipment is therefore not designed to hold a vessel off fully exposed coasts in rough weather or to stop a ship that is fast-moving or drifting. The type and size of the anchoring equipment is based upon the size of vessel and other criteria. A 25% reduction in anchor weight is allowed, for example, when high holding power anchors (HHP), such as the AC14 type, are provided.

An anchor provides maximum holding power when its flukes are embedded in the sea bed. This occurs when the anchor shank lies on the sea bed and the anchor cable pulls horizontally at the anchor shackle. When the pull increases, the cable lying on the sea bed is lifted off, creating a larger angle above the horizontal. As the angle increases, the holding power reduces. As a guide, a pull of 5 degrees above the horizontal reduces the holding power by 25% and a pull of 15 degrees reduces the holding power by 50%.

Therefore to maximise the holding power, the scope of the cable should be sufficient to ensure that, in fair weather, an adequate length of cable will lie along the sea bed, allowing the cable to pull the anchor horizontally. When this occurs, the cable rises gently into the hawse pipe. This is why extra cable is paid out when the wind, sea or current increases. The curve of the cable, or catenary, absorbs any shock-loading when riding to wind and sea. A catenary is necessary for the cable to have a horizontal pull on the anchor and ensure maximum holding power.

A scope of cable of 10 is considered optimal, while a scope of not less than five or six is adequate. Most larger ships are fitted with about 12 shackles of cable, approximately 330 metres for each anchor.

Consequently, in water depths exceeding 45 metres, the scope of cable achieved is less than six. In depths of up to 35 metres of water, it is impossible to achieve a scope of 10. However, the cable amount will also depend upon length of time expected to stay at the anchorage, weather, holding ground, and swing room.

Commercial Pressure

There is considerable commercial pressure on Masters. This has been exacerbated in the recent past by many factors, including:

- The need for quick turnaround times
- Having to be prepared at a moment's notice when the port advises that a berth is ready
- Easy communication access and hence immediate pressure from managers / owners / agents / charterers and terminal operators
- Having the vessel available to take stores and crew changes
- Trying to comply with shore-side instructions when few of those issuing the instructions appreciate the scope of problems the Master has to contend with, and few are concerned with the safety of the ship or crew.

The overriding responsibility of the Master is the safety of his vessel and crew. Those involved with the technical and commercial management of vessels should ensure that this responsibility is given their full and unequivocal support. This is possibly the single biggest contribution to the safety culture of a company and requires the active engagement of senior company managers.

Planning

Every passage plan should include provision for anchoring. If this is not done at the commencement of the voyage, the passage plan should be amended when anchoring is known to be a requirement. It is too late to read the pilot book when the vessel is already yawing 30 degrees.

- The Master to take charge of the anchoring plan in good time
- The Master to pick the time of day and location with due regard to safety of vessel
- The Master to consider the abort parameters and contingency planning
- Use all the known chart and pilot book information, regarding holding ground, water depths, proximity to shore, dangers, etc.
- Use local agent's information, including designated anchorage areas/restrictions, numbers of vessels at anchor, traffic density and movements, other local navigational information
- Study weather forecasts – not only the immediate weather but seasonal weather patterns
- Understand local tides and currents
- Take security precautions (for example, anchorages can be in areas where piracy is prevalent)
- Ensure the bridge team is trained.

Example 5 - Congested anchorages

A deep-draft, loaded tanker was proceeding at night to anchor under VTS instructions. It had planned to anchor at least seven cables away from all other vessels. With a full team on the bridge, it was observed during the final approach that five ships were anchored, all on westerly headings. When no more than four cables from the planned anchorage position and at a speed of less than 2 knots, it was noticed that a small cargo vessel had started to get under way, with initial radar information suggesting a crossing, near-collision course; the vessel was still displaying all deck and anchor lights. Although contact was made with the small vessel by VHF, and the smaller vessel agreed to keep a safe distance, it suddenly chose to alter course very close to the laden tanker's bow. The Master of the tanker had to order full astern in order to avoid a collision, and the small vessel passed less than 200 metres ahead.

Approaches to congested anchorages are fraught with dangers, even when planned or under competent VTS control. Masters should always confirm from the VTS before making an anchorage approach if there are any expected ship movements.

It is vital to have a full bridge team available, who know the anchoring plan and maintain a vigilant look out at all times.

- Masters must ensure the bridge team is well trained
- Masters must seek out advice on ship movements before entering congested anchorages, particularly at night

Safety Factors



Example 6 - Maintain a look-out

A tanker anchored about four cables from another small tanker. The following day, the wind increased in strength so that the vessel was now lying downwind from the small tanker. The Master attended the bridge at noon and left the OOW on the bridge. Two hours later, the Master looked out of his port and was unable to see the other tanker. Going up to the bridge, the Master found the OOW doing chart corrections.

Noting that the ship's heading had not changed, the OOW was questioned whether the other vessel had sailed. The OOW did not know. The small tanker was now seven cables aft of the beam and obviously in shallow water close to a sand bank.

The small tanker was called on the VHF and advised that it was probably dragging its anchor. Soon the small tanker got underway and re-anchored in deeper water. Noting the short time taken to heave up the anchor, it was obvious that insufficient cable had been paid out for the depth of water. By how much a collision between two vessels at anchor had been averted will never be known.

- Always maintain a good look-out, especially at anchor
- Be aware that other vessels' anchor watches may not be as diligent as your own
- Use your radar and GPS alarm rings as an additional warning tool

Anchor watches

Vigilant anchor watches must be maintained at all times. A certified watchkeeper must be on the bridge at all times, in all circumstances. In many of the incidents analysed, a poor anchor watch was a contributing factor. The OOW must be empowered by the Master to take all appropriate actions, such as using the engines if the circumstances require. The Master's bridge orders should be clear and robust in their content.

In maintaining an anchor watch, the OOW must ensure that:

- The latest edition of the largest scale chart is used at all times
- An initial anchor position is placed on the chart
- The position of his own vessel is maintained, with position checking by more than one means
- Positions of vessels close by are maintained
- Weather conditions are monitored in case they change appreciably
- A watch is kept on traffic movements
- Check the cable regularly

and have the confidence to call the Master whenever there is an appreciable change in circumstance.

However, in many incidents, it is found that diligent anchor watches were being maintained and the Master was called immediately, but the vessel still dragged its anchor and ran aground. The reasons include the fact that the vessel was either too close to shore, the engines were not immediately available, the anchor was unable to be raised in the prevailing weather due to windlass or hydraulic failure, or [the vessel] was unable to manoeuvre sufficiently in the adverse weather.

Anchoring in deep water

Company anchoring procedures should specify what is considered to be deep water. This will vary depending upon vessel type and size. A suggested depth of 40 to 45 metres could be used as a benchmark. Larger vessels often need to anchor in deep water and there are a number of well-known anchorages where deep water is a factor. There is a real risk of losing the anchor and cable when anchoring in deep water if it is not carried out in a controlled manner.

The OCIMF booklet Anchoring Systems and Procedures for Large Tankers gives clear advice. What is applicable for large tankers is also applicable for other large vessels, such as bulk carriers. One method recommended when anchoring in deep water is walking out the full length of cable required. This, however, requires an accurate estimate of the vessel's movement over the ground so as to avoid possible damage to the windlass.

Example 7 - Loss of both anchors and chain in deep water

A vessel was anchoring in deep water with the echo sounder reading 90 metres. The port anchor was walked back (lowered using the windlass) to 2.5 metres from the water and let go. The entire anchor was lost, including all the cable, when the bitter end parted from within the chain locker under the shock-loading. The starboard anchor was then also walked back to 4.5 shackles and the process repeated, with the same results. In addition to the poor seamanship, the company anchoring procedures were not complied with. The incident resulted in serious operational and financial losses, and the potential for serious injury to

The ship's anchoring procedures correctly stated:

"Extreme precautions are to be observed while dropping anchor in deep water". The following guidelines should be observed in order to avoid the loss of an anchor:

- Ensure that the windlass brake linings are in a good condition and the bottom band stopper is properly adjusted
- Ensure that the entire cable is walked out under power
- While lowering the anchor the vessel should be fully stopped with no speed over the ground
- After laying 1 to 2 shackles on the sea bed, use short burst of engine power, no more than dead slow ahead or astern to range the cable to the required length
- After the vessel is brought up, place the guillotine bar into the locked position. Tighten the windlass brake and disengage gear.

crewmembers should not be underestimated.

With large anchors, dropping the anchor in deep water can cause physical damage to the anchor itself, as well as increase the probability of losing the full length of cable, and of damage to the windlass, gypsy, the bitter end and/or chain locker.

Large vessels should always ensure that the cables are held with the 'guillotine', bar or cable stopper, and that the windlass brake is screwed up tightly.

Maintenance of windlass and anchoring equipment

The routine maintenance of the windlass arrangement and anchoring equipment is essential for any deck planned maintenance system (PMS). Clear instructions should be provided to ensure the ship's personnel are aware of the PMS requirements. This should include but not be limited to:

- Greasing and inspection by a qualified person
- Inspection of anchor securing arrangements
- Inspection and overhaul of windlass brakes, bands and linings, and cable stoppers by a responsible person
- Inspection and overhaul of windlass gears and clutches by a responsible person
- Ensuring cables are kept cleaned and well marked
- Inspection of anchor D shackles, shackle pins, crown pin, joining shackles, flukes and shank.





Safety Management

Mooring winch brake band testing

The windlass gypsy arrangements are nearly always combined with the mooring winches. The OCIMF Mooring Equipment Guidelines give comprehensive details as to the procedures for the testing of the mooring winch brakes. These tests should be undertaken annually, if possible, and should be part of the deck PMS. As a minimum, the test should be included when the vessel dry-docks and as part of the docking specification.

Company safety management system (SMS) manuals

The SMS manuals are there to provide guidance and instruction, and to cover all expected risks. They should also be clear and prescriptive.

Anchoring procedures must include guidance on:

- Empowering Masters to make the decisions necessary for the ship's safety – particularly with respect to commercial pressure, designated anchorages, VTS and pilots' advice
- Passage planning
- Choice of a good anchorage location, planning the anchoring position and approach in different weathers and visibility; bridge team management; traffic density, negotiating overcrowded anchorages with additional risks of collision; safety of swing room, under keel clearance
- Keeping a safe anchor watch, including position-keeping, proper use of radar and GPS guard rings/alarms. OOW use of main engine.
- The minimum requirement for Master's bridge orders
- When to have the engineers on stand-by, the engine room manned, and the main engines on standby or ready for immediate use
- Amount of cable, scope, holding ground, anchor holding power, proximity of shoreline, dangers of dragging anchor, and risk of collision and grounding
- When the vessel is in ballast condition, the use of additional ballast
- The use of two anchors
- The limitations on the anchoring equipment under heavy stress
- The use of anchors in an emergency
- Deep water anchoring
- Recognising when a dangerous situation is developing when at anchor and when to move
- Taking early and effective action
- Factors affecting a vessel when at anchor in heavy weather, including yawing and snatching
- Putting to sea in the advent of adverse and severe weather
- Safety of vessel with reference to security
- Clear instruction for the maintenance and inspection of the windlass, gypsy, anchors and cable
- Training/mentoring junior officers in anchoring techniques.

Lastly, owners and managers should consider carrying out meaningful navigational audit, which should include:

- Monitoring that charts and publications are current and correctly used
- Confirmation of correct use of passage planning
- Confirmation of bridge navigational competence
- Monitoring ship-handling when under pilotage
- Monitoring ship-handling when berthing
- Monitoring the anchoring abilities of the Master
- Bridge team management during specific periods.

Conclusion

Anchoring a vessel safely should be an uncomplicated operation. However, it can only be carried out safely with proper planning, with a properly instructed bridge team, and when positive on-board management and leadership are shown. The knowledge of how to anchor a vessel and the dangers when at anchor must be learnt in the years before becoming a Master. Owners and managers should ensure that such knowledge is transferred to junior officers through structured training and by making that knowledge available. Good seamanship and the practice of good seamanship are best learnt on the job whilst at sea.

Masters must be particularly aware when anchoring close to shore in poor weather or in poor holding ground. Good anchor watches must be maintained; precautions such as additional cable paid out and engines on immediate notice should be considered.

Masters must be prepared to weigh (lift) anchor early enough before a potential grounding situation develops.

The key issue that ensures that a vessel is safely anchored, and remains safely anchored, is the leadership and judgement shown by the Master. A significant factor in most anchoring incidents remains the failure of Masters to appreciate early on that a dangerous situation is developing and to take early and decisive action.

Acknowledgements: Nautical Institute, MAIB reports, CHIRP. AMSB *Pasha Bulker* report.

