Standard Safety

The Standard

Special Edition - Navigation

September 2009

CHRIS SPENCER
DIRECTOR OF LOSS PREVENTION
+44 20 7680 5647
chris.spencer@ctcplc.com

Introduction

This issue of the *Standard Safety* highlights the fact that collisions and groundings affect even the best managed and operated companies that put significant resources into training and supplying the best equipment.

Club statistics confirm the wider industry experience that even with new technology and various bridge training courses now available, collisions continue to occur. Collisions happen to all types of ships, trades and operating companies. The best operated companies that carry out rigorous training and officer development are also experiencing navigational incidents. Is it still possible today, with the modern technology available, to have collisions and groundings that, when analysed, are usually caused for the simplest of reasons?

We ask whether Bridge Team Management / Bridge Resource Management (BTM/BRM) training courses are the answer. The conclusion is that despite all the new aids to assist the bridge navigators, the human elements of lack of experience and knowledge, lack of correct bridge management and leadership, and a mixture of fatigue, overconfidence, negligence, and poor communication, training and shore management all combine so that major navigational incidents still happen.

BRM or BTM training courses are now often a requirement for many members. The oil majors want their navigating officers to have completed a training course and a significant number of owners are insisting that at least their senior navigating officers have attended these courses. Additional bridge training is of course a welcome response to the declining standards of the navigating officers, the increase of trade, bigger ships with deeper draughts, falling pilotage standards, and the cultural and language diversity of the officers on the bridge. But is it improving the basic navigational watchkeeping standards?

There is also evidence that passage plans and position keeping are not being carried out in a professional manner and that there is a lack of use of parallel indexing, for example, and position keeping are not being carried out in a professional manner.

Would you be happy to fly on an aircraft knowing that the pilot had never seen this plane or plane type before, never met the co-pilot before and this was his first flight with the company? So why do we accept it on ships,

which also carry people, and with the potential to cause huge damage to property and the environment?

To address this, we have a view from the aviation industry. BRM originated from the Scandinavian Flight Academy's Flight Deck (cockpit) Resource Management course and was 'marinised' in the early 1990s to produce BRM for the marine industry on page 15. Tim Crowch, an ex-airline pilot gives his view on BRM courses – which, as a trainer, he provides to many companies, using the aviation industry approach.

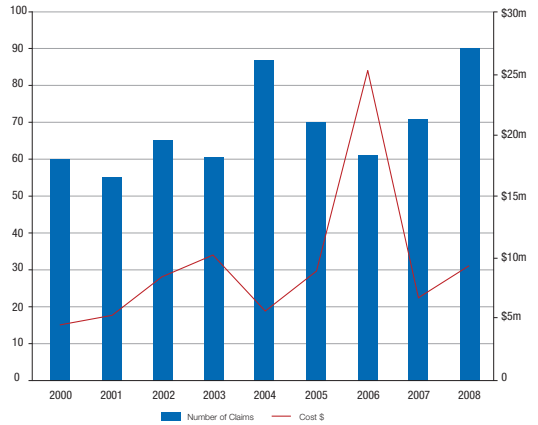
The club's Safety and Loss Advisory Committee recently made the observation that in a number of collision and grounding claims, the bridge team management had failed. The reasons for these failures continue to astonish, and often the comment is made that had 'common sense' prevailed or good seamanship been applied, the incident would not have happened.

In this issue

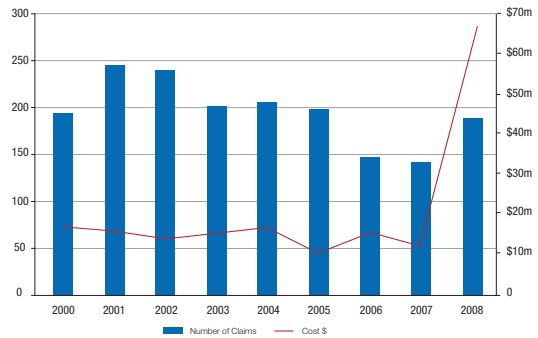
Club statistics

There were 214 ship to ship collision claims from 2000 to 2008. There were also 1,125 claims from contacts with fixed and floating objects (breakwaters, docks, jetties, quays and buoys). These cost the club approximately $80m. The number and cost of claims resulting from collisions slowly increased over this period, while fixed and floating object claims remained broadly constant over the period, with a significant upturn in 2008. Both types of incident can be attributed to failure on the bridge and, in a general sense, the BTM has failed in some form or other. Studies, which we outline further in this *Standard Safety,* clearly show that the number of incidents attributable to purely technical failure is small.

NUMBER AND VALUE OF COLLISION INCIDENTS 2000-2008



NUMBER AND VALUE OF FIXED AND FLOATING OBJECT INCIDENTS 2000-2008



Studies

The UK Marine Accident Investigation Branch (MAIB) carried out a 'Bridge Watchkeeping Study', which was published in July 2004 and looked at more than 1,600 collisions, groundings, contacts and near collisions between 1994 and 2003.

Key findings from the studies:

- 100% of the collisions involved a contravention of the COLREGS, of which 67% also involved collisions with a fishing vessel, of which 75% were underway (not fishing)
- 66% of collisions were due to a poor lookout or radar watch, contravening Rule 5 – keeping a proper lookout, and the majority were in the hours of darkness, with significant numbers of these between 2000 hours and 2400 hours
- 33% of all groundings involved fatigued lone bridge watchkeepers, the majority of which involved ships with only two navigators on board (master and mate)
- 60% of the collisions occurred when the watchkeeper was aware of the other ship
- nearly 30% of groundings (DMA study) occurred with a pilot on board, of which a small number were caused by technical failure

The MAIB made the following recommendations:

1. all ships should have at least one master and two bridge watchkeepers
2. a designated additional lookout should be on the bridge at all times unless a positive decision has been made to reduce this to a sole watchkeeper in daylight, good visibility and low traffic density, and when clear of navigational dangers
3. train and utilise the lookout properly; consider him as apart of the bridge team management

A 2008 study by the Danish Maritime Authority concurs with these findings

Member risk reviews

As part of the ongoing focus on loss prevention, the club conducts member risk reviews on shipowners' safety management systems. A full description can be found on the club's website; www.standard-club.com/ProductsAndServices/page.aspx?p=114

A part of these reviews is to consider how the member manages navigational safety and watchkeeping. Recent reviews carried out in the past year have identified a significant gap in management and leadership in respect of navigational issues, and specifically:

- no navigational audits carried out (41% of reviews)
- no ECDIS training carried out (24% of reviews) where applicable
- no BTM/BRM/additional navigational training carried out (50% of reviews)
- no formal ship-handling/anchoring training/mentoring carried out (45% of reviews)
- no effective monitoring of working hours carried out (30% of reviews)

These results, although taken from a relatively small sample base, do highlight that navigational safety is apparently not considered a high priority. Is it assumed that because the officer has a certificate of competency, he is an effective and competent watchkeeper? As an estimate, a deck officer would spend over 50% of his time on the bridge navigating and watchkeeping, and on some long haul trades, this may be considerably more. In any other industry, such an important activity would require a monitoring system ensuring continued competence. Navigational audits are a method to ensure confidence that the navigational officers are competent and can implement effectively the COLREGS.

Pilot error

The International Group of P&I Clubs keeps statistics on the P&I claims attributable to pilot error. There were 260 claims of over $100,000 between 1999 and 2004:

- 40 incidents a year related to fixed and floating objects
- 15 per year related to collisions
- 2 per year concerned major groundings
- 2 per year resulted in major pollution claims

There are no complete statistics available that indicate which country or port contributed the most number of pilot incidents per ship movement. However, there is certainly anecdotal evidence to suggest that, in some jurisdictions, there are ineffective pilotage authorities. Certain high-profile incidents demonstrate that there are also some supposedly well-regulated authorities that fail in their obligations to provide a competent pilot. The master should be able to expect a competent pilot properly licensed by the appropriate authority.

However, the master's responsibilities continue despite the presence of the pilot on board and he should always be aware of the passage plan being navigated. He should be confident enough in his ability to take over the pilotage duty himself should he be concerned about the performance of the pilot. The company's Safety Management System (SMS) must give masters the proper support and guidance in this respect.

Passage planning

In many cases, where grounding has occurred or where there has been a pilot error, for example, in the *Cosco Busan* incident, which is discussed later, the issue of passage planning was raised. Passage planning is no longer a question of having a list of waypoints, courses and distances. It is far more in-depth and should be considered an important task for the officer in charge of navigation; he should be given the time and resources to carry out a proper passage plan and have this drawn up with the input and authorisation of the master. After the passage plan is agreed, it should be available to the other navigating officers.

There is much guidance in the public domain on how to carry out a passage plan. A good start is the International Chamber of Shipping (ICS) – Bridge Procedures Guide Chapter 2 and the Nautical Institute – Bridge Team Management. Also available for specific areas are the comprehensive 'Passage Planning Guides', for example, the 'Malacca Straits'.

It is vital that a comprehensive and usable passage plan is carried out for the planned voyage. Some passage plans are too brief or so full of information that they are overly complex.

The commonly acknowledged principle of passage planning is broken down into four parts:

- appraisal
- planning
- execution
- monitoring

The navigating officer will at least require the following resources:

- up-to-date charts; chart numbers, charted dangers, subsea pipelines, rigs, oil fields, abort points, parallel index information, wheel-over information, suitable anchorages
- navigational warnings
- current and tidal information
- pilot books and sailing directions
- traffic schemes – high-density traffic and fishing vessel areas
- communication and reporting information
- weather information
- hazard / warning or precautionary areas noted on the charts
- pilotage information, boarding areas
- whether additional bridge resources / watchkeepers are required
- under keel clearance and squat information
- speed requirements

Should the voyage route be changed, the passage plan should be amended accordingly. When a voyage is interrupted, for example, when proceeding to an unplanned anchorage or after lifting the anchor, the passage plan must be adjusted.

The case studies show that often an incident occurred because the passage plan did not take into account that part of the voyage under pilotage. Passage plans must be berth to berth. The ship's passage under pilotage must be closely monitored. That cannot be done unless there is a plan to refer to.

An important aspect of ensuring that a proper passage plan is used is to have the outlines of the plan's requirements stipulated in the company SMS or bridge procedures. The SMS should lay down the format and the requirements of the passage plan as part of company policy and they should be audited as part of the in-house navigational audits or ISM audits.

There have been a large number of highly publicised collisions and groundings in recent years that have been thoroughly investigated. Some of these studies and the club's own claims give rise to conclusions that underpin the thrust of this article: that is, these claims are caused by human error and all are preventable.

1. *Cosco Busan*

The 147-page incident report on the 2007 *Cosco Busan* collision with the San Francisco Oakland Bay bridge was published in May 2009 by the US National Transportation Board (NTSB). The report criticised the pilot's role in the incident, the master, ship manager and the port VTS.

From a master's and shipowner's viewpoint, working with pilots of differing competences is a hazard of the job and one that has to be managed, monitored and controlled. The master is the master of his ship and must question the pilot's actions and at times be prepared to take over; it is his right and responsibility. However, to do this, the master has to be prepared, be assertive and have a good bridge team to support him. All masters should be able to manoeuvre and 'ship-handle' their ships, ready to take over from a pilot who is not performing. The company SMS must be clear in its guidance in providing support for the master if he is to take action.

The *Cosco Busan,* whilst navigating from the berth to sea with a pilot on board in restricted visibility, collided at 0830 hours with one of the base towers supporting the San Francisco-Oakland Bay Bridge, breaching a number of the ship's fuel oil tanks. This resulted in a spill of about 53,500 gallons of fuel oil, contaminating some 26 miles of shoreline. The total cost of the oil spill clean-up was in excess of $70m, bridge repair $1.5m and repair to the ship $2.1m.

The report identified that the pilot's (with 26 years' experience) cognitive performance was degraded due to him using a number of prescribed medications, which resulted in him making a number of navigational errors. The medical oversight of the pilot by the California Pilot Board and the USCG was criticised. The San Francisco ship traffic service (VTS) was also criticised. The pilot was sentenced in July 2009 to a 10-month prison sentence – the first pilot in US history. He pleaded guilty to misdemeanour charges, pollution and killing migrating seabirds.

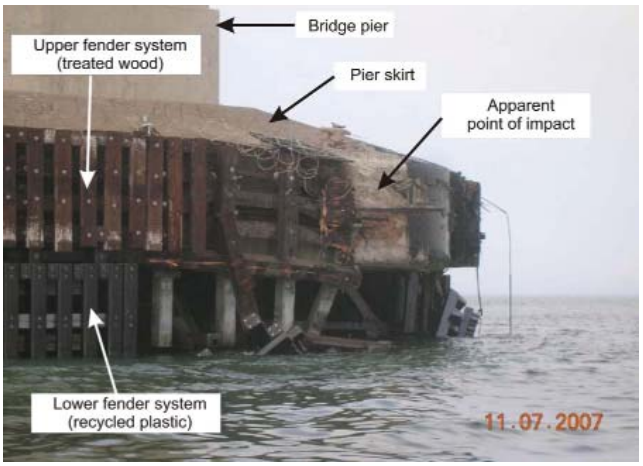
The ship managers in August 2009 agreed to pay a penalty of $10m to the US Department of Justice. This plea is subject to reviews in December 2009.

Part of the investigation board dissented with the way that the master's role was considered as a proximate cause of the accident. It was considered by this dissenting group that the master's role should be cited as a contributing cause rather than a probable cause. Many professional seafarers would agree with this position and that this would be consistent with previous incidents investigated in US waters.

COSCO BUSAN damage

San Francisco – Oakland Bridge

San Francisco – Oakland Bridge fendering



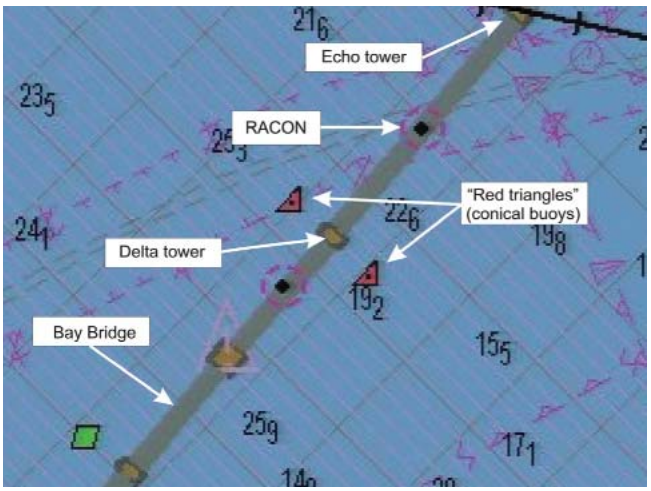
The ship's ownership changed 15 days before the incident. At this time, the whole Chinese crew and technical management changed. The management of change (taking over a new ship with a completely new crew to the ship and company) is a major operational and risk issue, and should be approached in a systematic way without being compromised by commercial pressures.

It was the master's first time on the ship, his first voyage with the new management company and his first time in San Francisco Bay. The master, it was reported, had not been to the ship manager's technical management office prior to joining the ship; his interview was done over the telephone. Neither the second or third officer had been on a ship of this size before. The navigating officers stated that they had not received training in passage planning, master's standing orders or bridge team management; the second officer stated that he had not received any guidance on the company Bridge Procedures Manual and he had not prepared a berth-to-berth passage plan.

The following are the significant NTSB findings made to the managers and bridge team:

- absence of a proper master/pilot exchange before leaving the dock; no effective communication between ship and pilot
- the master did not implement company safety procedures
- the master's ineffective monitoring of the pilot
- cultural differences that made the master reluctant to assert his authority over the pilot
- the ship managers failed to train the crew properly, which led to a failure in the bridge team performance
- the SMS provided was only in English and not in the ship's working language, which was Mandarin Chinese (all crew were Chinese)
- as the SMS was only available in English, the ship managers had not successfully explained to the master and crew the importance of following the SMS requirements

The Bay Bridge as displayed on the electronic chart



CONTINUED OVER

The NTSB made a number of recommendations to the San Francisco VTS, the USCG and the California Pilots Association.

The Board also made the recommendation to the IMO that cultural and language differences and their possible influences on mariner performance on the bridge are included in the bridge resource management curricula.

Although not specifically highlighted, it is of interest that within the report, the following navigation-related matters were noted:

- bridge team during restricted visibility (less than ¼ mile) consisted of the master, a relatively inexperienced third officer, a pilot and a helmsman on the bridge at the time of the incident
- the SMS required (as do the COLREGS) that in restricted visibility, ships proceed at a safe speed; the ship's speed over the ground at the time of the collision was about 10 knots
- bridge checklist noted that the pilot/master exchange had been discussed, but there was no evidence of these discussions on the Voice Data Recorder
- no passage plan from the berth was drawn up as required by the company SMS; only sea pilot to sea pilot passage plans were drawn up
- neither the master or the second officer (navigating officer responsible for producing the passage plan) briefed the bridge team members on the outbound voyage
- the master did not enquire from the pilot about the expected passage from the berth
- the pilot was confused as to what the 'red triangles' signified on the electronic chart (these indicated buoys)
- the electronic chart system (ECS) was not a certified Electronic Chart Display (ECD) and Information System (ECDIS)
- the Voyage Management System (VMS) included an Automatic Navigation and Track Keeping System (ANTS) module, which determined the ship's position and monitored the ship's advance against the planned track but it was immobilised
- the berth-to-berth passage plan submitted to the NTSB was found to have been drawn up after the incident

COSCO BUSAN – Lessons to be learnt

A number of club members have made the comments that their masters have had problems with pilots. Like all walks of life, there are good, bad and plenty in between. The pilot/master relationship is very important and it is up to the master (and the pilot) to make it work. This cannot be done without communication and dialogue.

- masters cannot rely on the competence of the pilot alone; do not simply assume that the pilot is competent
- the master must have a formal and effective pilot/master information exchange
  - this is part of the company SMS and if the pilot does not want to have such an effective exchange before leaving the berth then the master should instruct him to leave the ship and ask for a replacement
  - the master must question the pilot if he is not certain of the pilot's actions and, in certain cases, must be prepared to take over from the pilot. (The NTSB report stated that the master did not feel comfortable questioning the pilot because of the pilot's off-hand manner, which may have been due to the cultural difference between the pilot and master)
- masters have to deal with all nationalities, that is a part of being a master. Ship managers and owners should ensure that masters have this ability instilled in them
- good bridge team management should be modelled to overcome this cultural divide
- do not allow navigating officers to navigate by GPS alone
- shipowners must make the management of personnel the highest priority. Owners have a responsibility to have a personal contact with senior officers before they are engaged and to maintain that relationship
- companies must allow for thorough ship familiarisation when taking over a ship; commercial considerations must be secondary to the crew becoming familiarised with the ship
- management of change procedures should be agreed by the senior management
- make sure the bridge team is well prepared and resourced
- BRM/BTM courses should include assertiveness training for navigational officers
- passage planning berth to berth must always be undertaken

2. Quay contact

A 30,000 dwt ship was entering a harbour basin through a narrow cut to berth. The master was familiar with the ship and had been to this berth a number of times before and was not required to take a pilot. The chief officer, who was the watchkeeping officer, was sent down to the main deck to prepare for berthing once the ship had entered the cut, leaving only the master and a helmsman on the bridge. The weather and visibility were good.

The ship came out of the cut at about 4-5 knots on a northerly course and the master directed the ship to port so that he could later take a turn to starboard to align the ship for the berth approach. The master instructed the helmsman to take the starboard turn and, at the same time, went into the chart room to talk to the second officer, who was not engaged in any navigational duties but was carrying out pre-arrival paperwork. Although the master was only in the chartroom for a matter of minutes, when he emerged, it was evident that the ship had not turned as much to starboard as he had wanted and it was apparent that the ship was going to hit the quay. There was too little room ahead to stop the ship, and so the master rang half ahead on the engines to produce an increased water flow over the rudders to increase the turning ability of the ship. Unfortunately, the manoeuvre was not successful and the ship hit the quay straight on at a speed estimated to be about 6-7 knots. The quay damage claim was in excess of $2m. The ship downtime and repair costs were also significant.

Lessons to be learnt

- familiarity and overconfidence can result in disaster
- always maintain a proper team on the bridge, particularly when berthing
- the helmsman, who would have seen the incident develop, should have sought the master's attention – this shows lack of crew initiative and training
- navigational procedures should be applied correctly
- carry out effective navigational audits
- BRM/BTM should be considered to be a company requirement

3. Collision with an anchored ship

The master of a 30,000 dwt tanker was bringing his ship to the fairway buoy at a major west African port to pick up the pilot. However, the pilot, as is often the custom, instructed the master to bring the ship in through the breakwaters where the pilot would board in calmer waters with no swell. The breakwater entrance was quite narrow and the final berth was only half a mile inside the breakwater entrance. Once through the breakwater, the ship with minimum way waited to embark the pilot, drifted and collided with a small, anchored, fully laden products tanker, puncturing the hull, spilling 500mt of gas oil, causing considerable pollution and damage to the anchored ship, which then partially sunk. Due to the partially sunken ship, the berth was also restricted in its operations. The total cost of the claim was over $2m. The damage to the inbound ship was minimal and did not even affect class.

Lessons to be learnt

- masters should be reasonably certain that the pilots are available at the pilot station, before arriving
- passage planning should provide for an abort strategy if the pilots are not available - the pilots are hired to bring the ships in and masters should not undertake navigating in harbour waters without a pilot unless they have the local knowledge and authorisation to do so
- ensure that bridge procedures are robust; masters should understand that not taking the pilot at the pilot station can present a risk
- when masters do abort or delay an arrival at the pilot station for these reasons, the owner should be willing to support the master's decision

4. A change in the passage plan

A panamax ship in ballast was transiting from one Chinese port to another, about 24 hours' steaming distance. Prior to departure, the master was advised that the usual approaches to the next port were restricted due to the fact that the military were carrying out exercises. A sea area was identified to avoid and the master asked the agent for advice as to how to proceed, whether to go around the military area on the seaward side, incurring an additional amount of steaming time or to go inside the area close to the coast, or wait until the exercise was over. The master decided to take the inside route and navigated the ship around the western inshore edge of the exercise area. Unfortunately, this area contained a number of fish farms, which were not identified on what were believed to be the up-to-date and properly corrected charts. This was because these fish farms had not been reported to any recognised hydro-graphic authority. A significant number of these fish farms were damaged and the owners made many successful claims totalling over $3.5m.

When a passage plan changes radically, particularly in congested and inshore waters, a risk assessment should be carried out. This may include asking the agents specific and clear questions so the answers can guide the master in making his plan. Masters should be aware that in less regulated areas, where charted information may not be so accurate, a wider safety margin is necessary. Masters should also realise that the agents replying to an emailed request for advice probably have no sea experience and little appreciation of the master's responsibilities.

Lessons to be learnt

- masters must carry out a risk assessment if their passage plans radically change, particularly in inshore waters
- masters should always take a cautious approach when navigating in unfamiliar areas; always take the safest route
- masters should ask specific questions of agents, and request they refer to a harbour master or port captain
- the SMS and passage plan should indicate an acceptable under-keel clearance
- BRM/BTM may have been of assistance; the training confirms the need to be cautious and to always check and assess the risks

5. Running into a 30-metre landfall light tower at night

A deep draught ship was approaching a major North American port. Prior to arrival, the master was advised to anchor to wait for the pilot to berth. The master anchored in a dedicated anchorage temporarily and a number of hours later, the ship was instructed to heave anchor and make way to the pilot station, about four miles away, during the hours of darkness. The pilot station was close to a major fixed navigation light tower, a structure standing 30 metres above sea level and giving a racon and light visible for over 40 miles.

The experienced master had the 'con', assisted by a relatively inexperienced second officer and a helmsman. No new passage plan was drawn up and the ship was being navigated to 'master's orders and directions'. The second officer was plotting the ship's progress on the chart, taking regular positions, and it was evident that the ship was moving towards the fixed light with a zero 'closest position of approach'. The second officer commented to the master that the ship was on a collision course with the light tower; however, the investigation concluded that this fact was brought to the master's attention in a less than robust manner. The light was also clearly visible right ahead. The master failed to take any effective action in time and the ship hit the light tower, severely damaging the structure.

The tower replacement cost approximately $2m. There was no damage to the ship.

The company had a policy to ensure that all bridge officers attend a BRM/BTM course. The content and format is being reviewed to ensure its effectiveness.

Lessons to be learnt

- the master should use the bridge resources effectively
- the second officer must be assertive enough in notifying the master of the fact that the ship is on a collision course
- a new passage plan should be made
  - amendments should be made to the passage plan
  - new courses drawn on the chart
- the master must notice the positions placed on the chart or consult the ECDIS even when under pilotage
- the master should compensate for the effect of current on the ship's drift
- an alteration of course should be sufficient to avoid collision
- BRM/BTM training should be effective

6. Grounding in broad daylight

A fully laden products tanker with a draft of 12 metres on a regular run grounded in broad daylight whilst proceeding to a small Caribbean port, an hour away from the pilot station. The ship was operated by a major tanker operator, the bridge equipment was fully operational, including ECDIS with track control system, 2 x GPS, and S and X band radars. A comprehensive passage plan had been drawn up, parallel indexing marked and hazards shaded on the largest-scale charts. Position fixes using radar bearings and ranges were taken at least every 10 minutes. However, the normal passage plan had been amended by the master to reduce the steaming distance marginally and this brought the ship closer to the land, from six miles to less than two miles.

The watch was handed over to a junior, inexperienced navigating officer of the watch (OOW) in the correct manner and one hour's notice was given to the engine room. The OOW called the pilots to make contact a number of times over the next hour without success and the master, who was in his cabin completing paper work, was kept advised. In accordance with the passage plan, the ECDIS alarms indicated the waypoint alteration of course and the OOW ordered the new course to be steered in hand steering by the lookout, rather than allowing the track control system to carry out the alteration of course. The master arrived on the bridge, rang standby engines and took the 'con'. Moments later a heavy shuddering was heard and the ship was firmly aground.

The ship was refloated six days later after lightering operations.

Lessons to be learnt

- ensure sufficient experienced personnel on the bridge
- OOW should navigate according to the passage plan
- OOW should comply with the master's standing orders
- OOW should use parallel indexing techniques according to company bridge SMS and master's standing orders
- the master should comply with his own standing orders
- OOW should allow for the wind effect on the alteration of course
- any amendments to the passage plan should consider the risks of bringing the ship closer to shallow water, giving less margin for error

The investigating maritime authority also made the following recommendations:

- consider formalising the bridge manning levels in the passage plan
- re-emphasise the importance of basic navigational principles to the navigational sea staff
- re-emphasise the principle to masters that it is more important to ensure the navigational safety of the ship than to have the paper work completed

A GROUNDING

7. Grounding in the Dover Straits – Is your ship's ECDIS certified?

A 10,000 teu ship drawing a draught of 12 metres and sailing in a south-westerly direction outbound from Europe through the Dover Straits grounded on the Varne Bank at night. This incident was investigated by the flag state.

The weather was moderate with winds force 4-5 and with occasional force 7 gusting, visibility at the time of the incident was eight nautical miles, with a north-easterly current of about 1 knot, and there was a neap tide. The ship's speed was 21 knots.

The experienced chief officer had not sailed on this ship before and had joined the ship six days previously, after a five-hour handover. Before the incident, the chief officer, who was on watch at the time, had carried out cargo duties at three north-west European ports, including his joining port. His working hours significantly exceeded the allowed times and, during the 24 hours prior to the incident, he had been working for 18 hours. His weekly working hours count was 76 and the casualty report indicated that on the day of the incident, he was overtired.

The Varne Bank can be passed on either side by south-westerly transiting traffic, although larger ships usually pass to the south. The north-east corner is marked by a light ship with a racon and the eight-mile shallow banks are identified by cardinal buoys.

As the ship was passing the Varne lighthouse, the two cardinal buoys, E Varne and mid Varne, were mistaken for be fishing vessels and the chief officer altered the ship to starboard – straight over the Varne Bank – and ran aground. The ship suffered minimal damage, but it could have been significantly worse.

The ECDIS system was not an approved on-board navigation system as per SOLAS Ch V Reg 34; it should only have been used as a back-up to the traditional charts.

Lessons to be learnt

The flag state highlighted the following lessons:

- the lookout's duties were not sufficiently specified or managed, there was a lack of communication between the lookout and the navigating officer: Engage your lookouts to be useful bridge team members, and train and encourage them
- effective bridge team management was not carried out
- fatigue could have been a factor
- the crew's inadequate voyage management system skills, incorrect depth contours, chart alarms and depth alarm settings on the ECDIS may have caused the incident
- disregard for conventional navigation techniques
- due to the ECS unapproved status, the observed positions should have been placed on the paper chart
- incorrect identification of the Varne lighthouse and cardinal marking buoys

The IMO Safety of Navigation subcommittee resolved in July 2008 to make it mandatory for some ships to be equipped with ECDIS. In the meantime, it is imperative to confirm which on-board systems currently fulfil approved ECDIS status and if these systems are certified by the flag state.

A number of recent surveys and member risk reviews have identified that whilst many ships are fitted with ECDIS, not all are certified. That in itself is entirely legal; however, a significant number of the navigating officers have not been trained in the use of the ECDIS or ECS systems. Members are advised that some flag states require that the officers are trained in the use of the ECDIS if fitted. The argument that it is only being used as an aid to navigation, that is, the ship is also using paper charts, is not a very convincing one. If you have ECDIS fitted, the operators of that equipment should be trained. There have been a number of incidents where the use or misuse of ECDIS was found to be a contributing cause.

In addition, the flag state casualty report made the following recommendations:

- senior navigating personnel to be trained in different voyage management systems
- understanding of the different systems – status information such as Raster Chart Display System (RCDS), ECS or ECDIS
- navigating should always include active monitoring of the radar image
- unless using an approved ECDIS, positions should be monitored on the paper charts
- owners should consider watch arrangements for coastal trading to ensure compliance with the working hours regulations; fatigue is a continuing problem contributing to major incidents
- navigating officers using ECDIS should be trained in its use even if it is not a certified system

8. Are you using ECDIS on your ships as an aid to navigation?

A ro-ro ferry was operating out of a north European port. The weather was force 10, with 55 knot winds, and moderate visibility. The ship was slow steaming at about 10 knots in an area used for waiting outside the port, as the port was closed due to poor weather. After a number of hours, the officer of the watch was distracted by an internal fire alarm and even though he was aware that there was a charted shoaled area close by, he was unaware of a charted wreck on the shoal. The OOW was navigating by eye and using the electronic chart system (ECS), which he was untrained in; he did not understand the limitations of the system. The wreck would not have been displayed on the electronic chart due to the user settings in use at the time. Paper charts were available, but only occasional positions were being fixed on the chart and it was not referred to at the time. Whilst executing a turn, even though in the proximity of the shoal patch, the ship struck the charted wreck. This resulted in the loss of one of the propeller hubs, and a portion of the tail shaft damaged the stern tube bearings and also bent the intermediate shaft and damaged the rudder. It could have been worse.

The ship was fitted with full ECDIS – although this was only being used as an aid to navigation. For ECDIS to be used as a primary means of navigation, the approval of the flag state is required. The ship carried a full set of up-to-date and corrected charts. The officers on the bridge were using the Vessel Management System, which was not approved by the flag state, as a primary means of navigation and a number of officers using it were not trained in its use. ECDIS can only legally be used (as per SOLAS Regulations 19.2.1.4) as a primary means of navigation if the approved electronic navigational charts (ENC) are used with a back-up system and the operators are trained. The UKMCA, for example, will not approve an ECDIS system until all operators are suitably trained.

Lessons to be learnt

- unapproved systems should only be used as an aid to navigation
- where an electronic navigation system is fitted as an aid to navigation, the operators should receive proper training
- OOWs navigating in congested and restricted waters should have their undivided attention on the navigation of the ship

Are your ships using an ECDIS and/or an ECS system unapproved by the flag state? If so, is it being used as a primary means of navigation? Are the operators of ECDIS and ENC trained in their use?

ECDIS – Are you prepared?

STCW 95 has not recognised the sophistication of equipment being introduced on the bridge. ISM, however, requires the shipowner to ensure that his navigating officers are competent in their duties. If ECDIS is being used for navigation, the navigational watchkeepers must be competent in its use. They must have knowledge of its operations and limitations. Operating manuals cannot be considered a substitute for a full understanding of its operations.

Members and ship managers should:

- ensure their navigating officers are fully trained if using ECDIS for navigation
- ensure that navigating officers are aware of the limitations of ECDIS
- ensure that bridge procedures are updated to take account of ECDIS, including:
  - different working practices
  - changes in passage planning
  - preventing crew reliance on ECDIS, cross-checking information by traditional means
  - understanding of different chart presentations - raster and vector

The compulsory introduction of ECDIS will require substantial training and familiarisation resources.

ECDIS – Are you prepared?

IMO has ratified that an ECDIS is to be a mandatory part of the ship's bridge equipment, with the compulsory introduction being scheduled as below:

The timetable looks like this:

Ship type size	New ship	Existing ship
Passenger >500gt	1 July 2012	No later than first survey after 1 July 2014
Tankers>3000gt	1 July 2012	No later than first survey after 1 July 2015
Dry cargo>50000gt	1 July 2013	No later than first survey after 1 July 2016
Dry cargo>20000gt	1 July 2013	No later than first survey after 1 July 2017
Dry cargo<20000gt	1 July 2013	No later than first survey after 1 July 2018
Dry cargo3-10000gt	1 July 2014	No retrofit required for <10000gt

All companies should be planning to have suitable training programmes set in place now if they are not already in place.

9. A classic collision. Do your navigating officers know the COLREGS?

During the 1200 to 0400 night watch, a collision occurred between a fully laden 16 knot VLCC tanker and a 24 knot container ship in the Indian Ocean. The container ship was on an east south-easterly course and had the VLCC fine on her starboard bow on a near reciprocal course. The container ship was fine on the port bow of the VLCC. There was a reasonable amount of traffic in the area.

Both second navigating officers had identified the other ship. The officer of the VLCC plotted the container ship on the ARPA, the container ship watchkeeper had seen but not targeted the VLCC on the ARPA. Visibility was good. At seven miles apart, the container ship's closest point of approach would have been two miles ahead of the VLCC. At about four miles apart, the container ship altered course slightly to starboard (through small progressive course changes), reducing the closest point of approach to approximately zero. At three miles apart, there was five minutes to the closest point of approach, with a combined speed of about 40 knots. At about this time, the container ship made VHF contact and there was an apparent agreement to pass port to port, but the VLCC replied that he (container ship) was already changing course to starboard, which was incompatible with a port-to-port approach. The VLCC starboard was also altering his course in small increments to port, the container ship was doing the same to starboard.

One minute before the collision, the VLCC watchkeeper woke up the master, who was unable to prevent the two ships colliding.

There was extensive damage to both ships, but no loss of life or pollution. It could have been much more serious.

The second officer of the VLCC had only had his second officer's certificate issued the previous year and was therefore relatively inexperienced. The second officer of the container ship was experienced.

The VLCC operator is now carrying out extensive and sophisticated BTM/BRM training for all its navigational officers.

Navigational audits can check that the navigational watchkeepers know how to apply the COLREGS correctly and if additional training is required.

Lessons to be learnt

The flag state carried out an investigation and made the following telling recommendations:

- owners should ensure that OOWs have a good knowledge of the COLREGS
- OOWs should have regular sessions and training on bridge simulators to ensure they are qualified in the use of ARPA and AIS
- regular sessions on bridge simulators to ensure OOWs can appropriately apply the COLREGS
- OOWs using E-navigation equipment (ECDIS, etc) must be trained
- OOWs must understand the importance of calling the master in time
- VHF use is not a substitute to complying with the COLREGS

A COLLISION

10. Keeping a lookout

A 5,000 teu container ship had just left a busy Chinese port and was on a east south-easterly course. The ship was navigating on autopilot at 25 knots through busy waters, including heavy concentrations of fishing vessels and many coastal hazards, including traffic separation schemes. At 1600 hours, the chief officer took over as the OOW, with visibility improving to nine nautical miles. Both radars were operational and the ship was using an ECS with unapproved data, so it was only being used as an aid to navigation and paper charts were being used for navigation. The OOW of the container ship at the time of the collision had plotted only two positions on the chart during the previous 150 minutes. This was in a coastal seaway with many navigational dangers, such as rocks and islands.

The master came to the bridge at 1900 hours but soon left, leaving the chief officer as the sole watchkeeper on the bridge at this time even though it was dark (the lookout was on standby in his cabin).

The other ship, a handy-sized bulk carrier in ballast was inbound to the Chinese port on a west north-westerly course doing approximately 12 knots, on hand-steering because the autopilot was not functioning and the AIS was inoperative. The OOW was also accompanied by a lookout, who reported a red steaming light about two points to port at about six nautical miles' distance with a speed of 20 knots. According to course records, the bulk carrier altered course marginally to port and then to starboard, in part to avoid a crossing fishing vessel. Once the distance between the fishing vessel increased, the container ship was showing both sidelights and was at a distance of 2.5 nautical miles. The bulk carrier altered to starboard by 15 degrees to provide more sea room. Two minutes before the collision, only the green sidelight was visible on the container ship and hard to starboard was ordered on the bulk carrier. The collision resulted in both ships being firmly wedged together. Within an hour, the crew of the bulk carrier boarded the container ship as the bulk carrier started to list. Five days later, the ship sank. There was also considerable damage to the container ship.

The flag state investigation reported that the bulk carrier was never seen by the container ship until the last moments prior to the collision. Even with a fully operational ARPA, the bulk carrier had not been acquired as a target, although other ships, including a number of fishing vessels, had been acquired as targets.

The flag state's analysis of the collision made the following comments:

- there was no lookout on the container ship. The legal requirement to have a lookout on the bridge was not complied with, contravening the COLREGS, STCW and flag state regulations as well as company SMS requirements. The ship was transiting a difficult navigational area with heavy fishing ship traffic
- radars were set at a six-mile range; this was inappropriate when considering the combined speed of approach of 38 knots
- neither ship complied with the COLREGS
- fatigue was a potential contributory factor. It was conclusive that the OOW on the container ship had far exceeded his working hours over the previous week. In fact, he had worked virtually continuously for the previous 24 hours. The OOW workload had exceeded the permitted maximum limits for a number of months prior to the accident
- the working hours of the lookout able body seamen, who was on standby in his cabin, also contravened the STCW Code
- no data from either ship's voyage data recorders was retrievable as neither was operational

Lessons to be learnt

- ensure the SMS/bridge procedures are always followed
- ensure there are proper bridge resources available when navigating in coastal or high traffic density areas
- always maintain a lookout in accordance with Regulation 5 of the COLREGS
- use the radars correctly with long-range scanning
- always observe a safe speed in order to take proper and effective action
- observe the STCW working and rest hours regulations
- use the ARPA correctly, acquire targets

Conclusion

The anecdotal and specific evidence all point to a trend that collisions with other ships, groundings and contacts with dock structures are not decreasing even with the introduction of sophisticated navigational equipment and the use of BTM/BRM. This could also be related to the shortage of officers. The anecdotal perception is that the knowledge and experience of officers is falling, contrary to the increasing demands made on watchkeepers. However, the focus on the main task of being a seafarer, and that of navigating the ship safely, does not appear to be taken up effectively by many owners or managers.

There is evidence:

- that in some ships crew numbers are not sufficient for the demands of certain trades, although within the safe manning certificate
- that owners and operators do not confirm the effectiveness of the bridge watch keepers
- of widespread ineffective understanding of the COLREGS
- that effective BTM/BRM training should be considered
- that non-approved ECS and ECDIS are being used without the officers being trained in their operation. ECDIS will be mandatory within five years and training will be necessary
- that a significant number of masters' management of their crew resources is ineffective
- that companies do not adequately nurture and build upon the master's leadership role; company SMS is often defective in providing the master with the tools to support him when making difficult decisions
- that companies are not effectively addressing the master/pilot relationship
- that fatigue is an issue especially on short sea trades and ships calling at a number of ports in a short time

These navigational and training requirements are fairly simple to achieve and shipowners who have not already done so, should therefore address them.

Bridge team management / bridge resource management training

BY TIM CROWCH
ADVANCED SYSTEMS
SAFETY MANAGEMENT
+41 79 407 3120
info@assm.biz

A personal viewpoint from the aviation industry

As we are all aware, the marine industry's Bridge Resource Management (BRM) training concept has its roots in the airline industry's original Cockpit Resource Management programme, which evolved into Crew Resource Management (CRM). The latter is now in its sixth generation.

The creation of this concept was a direct result of the worst accident in aviation history when, in March 1977, following several warnings that the industry had chosen to ignore, our worst nightmare became reality; two Boeing 747s collided on the ground at the high elevation airport on Tenerife in poor visibility. As with all major disasters, a number of latent conditions had remained dormant within the system awaiting a trigger at the "sharp end" and unleashed the destructive forces of human error. In one afternoon, 583 people died as a result of that trigger – a communication error in one of the aircraft's cockpits exacerbated by an overly steep authority gradient and ineffective intervention or assertiveness on the part of the junior officers. This is a scenario that is being reproduced on too many bridges as I write, and the casualties noted in this newsletter are testimony to this observation.

Immediately following Tenerife, one of the involved airlines, KLM, under the direction of the late Frank Hawkins, a human factors expert and a captain with the airline at the time, created its KLM Human Factors Programme (KHUFAC), which focused solely upon human behaviour and the human's physiological limitations. The overriding aim of these courses was a radical improvement in interpersonal behaviour in actual day-to-day operations.

BRM has the same aim, but the marine industry appears to be approaching this identical area of concern in a very different way with, at best, very mixed results. This is not a new concept, but amongst officers of all ranks who have undergone BRM training, there is little evidence that the teaching has been taken to heart and is being practised consistently.

The marine industry has identified that 70-90% of its casualties emanate from human error or substandard human performance. This immediately provokes a question – what percentage of the allocated training budget is now being directed towards non-technical skills? In practice, this is notably very little compared to that allocated to traditional technical skills. This chronic imbalance must be addressed urgently. Another provocative question to be posed is – what is the real purpose of expenditure on BRM today – to fulfil a legal or oil major minimum requirement or genuinely to improve crew interpersonal behaviour on the bridge under all working conditions? Put another way, hand on heart, what philosophy is in reality being adopted, that of minimum compliance or that of best practice?

If it is the former, then this is a strategy destined to fail; if the latter, then there are real signs that BRM, in its current form or methods of instruction, is not producing the desired results.

For some considerable time, the training industry has been offering Human Factors (HF) training to marine crews of all grades. All participating crew members have already completed a BRM course and yet most of what we are teaching them is claimed to be "new". Not only is the material new but so, too, is the concept.

CRM in the aviation world is now compulsory and is a central component of every aspect of pilot and cabin crew training. A yearly refresher is mandatory for all and this is undertaken in a classroom with a trainer or facilitator, who also has to undergo refresher training on a regular basis and is occasionally observed by examiners from the State's Civil Aviation Authority.

The marine industry, on the other hand, is taking a different approach, where the largest part of BRM is computer-based and the participants complete the course by ticking boxes. Personally, I have difficulty in understanding how mouse clicks can instil a new form of behaviour in a person. Multiple-choice answers give hints towards the correct answers and knowing the answer is not the same as instinctively acting on it. I am convinced that this has to be trained in the real-life working environment, with all officers playing their role – not someone else's.

CONTINUED OVER

Our firm belief is that behavioural training, which is the basis of BRM like aviation's CRM, is best carried out in simulators in real time with a real crew; ideally, each participant plays his/her actual role. Only in this setting can there accurately be reproduced the blend of and interaction between the multi-cultural crew from Europe, the Indian subcontinent and the Far East that is international shipping today. Computer based training does nothing to enhance team performance across this spread of radically differing national cultures.

The HF training modules can be integrated into an already planned technical training programme at considerable cost saving to creating a separate training programme. We have adopted aviation's Line Oriented Flight Training (LOFT) principles in that the training takes place in real time with scenarios that are as realistic as possible – no tricks or traps, but with clear learning objectives and offering the crews multiple solutions. This is accomplished in a "no threat" environment where there is no checking or qualification and where no written appraisals are made. There is extensive debriefing at the end of the sessions, with most crew members self-debriefing; the primary focus being on performance improvement. The learning environment should replicate everyday operations as closely as possible.

It is necessary that the whole bridge crew from master to helmsman be present in order to not only represent the crew's team performance but to convince the crew that this is the behaviour that is desired on their actual ship; hence, the requirement that a master be present. It is impossible to train "behaviour" in isolation. The working environment in the actual workplace must also be conducive to attaining and further improving the desired behaviour.

We often hear the question, "This has been really enlightening, but how will it be when I return to my ship?" The fact that the master and the most senior officers have been exhibiting the same behaviour in the simulator should go some way to reassuring the younger officers that this new behaviour will be accepted by all and will form part of a new operating safety culture – just as we did in aviation.

If an improvement in the casualty rate is genuinely desired, then the behaviour on the bridge must change – not just be taught to change. This also demands that a new "just" corporate operating culture accompany the training, otherwise the prevailing old traditional culture will nullify the instruction of the new. For the new behaviour to become firmly established and to flourish, it is incumbent upon owners and fleet managements to promote a fair and just culture over their entire fleet. It is easier to change the system than it is to change the human condition.

It is also crucial that other "crews" are integrated into this training, including engineering staff, marine pilots and shore-based personnel. Only then will the new doctrine become uniform and the displayed behaviour evolve from being "new" to "normal".

Aviation did not get the CRM recipe right the first time and, after 25 years, it is still evolving. However, what has been created to date has had impressively positive results as the aviation industry's record proves. I encourage the marine industry to seize the opportunity to continue to learn from aviation's mistakes, without squandering limited but valuable resources on repeating them. An investment in non-technical skills training is precisely that – an investment – it is not a cost; it is an added insurance protecting future profits as no one budgets for an accident. It is a highly cost-effective form of asset and wealth protection.

Tim was a professional airline pilot for 32 years of which 25 years were spent with Swissair, 15 years as a senior captain on A320s and MD11s, and more than 20 years as a specialist in accident investigation and flight safety programme management.

In 2004, he left the aviation industry and completed an MBA in Lausanne. He embarked on a new journey as a forensic investigator, offering expert assistance to large law firms and the insurance industry as well as producing safety training programmes for other complex industries based upon aviation methodologies.

His company, "Advanced System Safety Management", based in Switzerland, is a leading provider of training courses in patient safety and safety programmes for Swiss hospitals, clinics and other healthcare institutions. This has also been extended to the nuclear power and marine industries.

www.assm.biz

The Standard P&I Club

Standard Bulletin is published by the managers' London agents: Charles Taylor & Co. Limited International House, 1 St. Katharine's Way, London, E1W 1UT England
Telephone: +44 20 7488 3494 Fax: +44 20 7481 9545 Emergency mobile: +44 7932 113573 E-mail: p&i.london@ctcplc.com
Please send any comments to the editor – Chris.Spencer@ctcplc.com Telephone: +44 20 7680 5647

standard-club.com