IMMINGHAM EASTERN RO-RO TERMINAL DEVELOPMENT CONSENT ORDER APPLICATION

PINS REFERENCE TR030007

DFDS' ANSWERS TO THE EXAMINING AUTHORITY'S SECOND WRITTEN QUESTIONS

Question reference	**Asked of**	**Question**	**Answer**
BGC.2.02	Applicant, CLdN, DFDS, IOT Operators, Marine Management Organisation (MMO) and Natural England (NE)	**Government policy concerning need and sustainable port development** With respect to the Government's policy relating to the need for port development and the encouragement for "sustainable port development", including what is stated in the entirety of paragraph 3.3.3 of the National Policy Statement for Ports 2012 (NPSfP), and having regard to the cases you have made to date, explain in policy terms, why you consider the Proposed Development would or would not comply with the Government's encouragement for sustainable port development. In answering this question, the Applicant and other IPs are encouraged to make concise submissions and to address the matters listed in paragraph 3.3.3 of the NPSfP, as relevant.	Paragraph 3.3.3 of the Ports NPS identifies a number of criteria that new port infrastructure should satisfy to help meet the Government's policies on sustainable development. One of those is that the new infrastructure should we '*well designed, functionally and environmentally*'. DFDS do not agree that the Proposed Development complies with that criterion. DFDS does not consider that the Applicant has demonstrated that the proposed infrastructure is well designed in light of the safety risks it poses and likely implications on the commercial operations at the Port of Immingham.
NS.2.05	Applicant, CLdN, DFDS and IOT Operators	**Stakeholder input to assessment of risks** Further to the Maritime and Coast Guard Agency's (MCA) advice in [REP1-021] that the organisation responsible for Port Marine Safety "should strive to maintain consensus	DFDS believes that the main obstacle to achieving consensus is the Applicant continuing to dismiss the genuine and serious safety concerns that are being raised by DFDS and others, for example the wind data, the

		…through … stakeholder engagement and …review of risk assessments with users…" what are the main obstacles to achieving consensus and what are the prospects of achieving consensus by Deadline 5 of this Examination?	direction of current, the impact on the Eastern Jetty, the lack of simulations at Berth 3 and making available the information related to the Selin S incident. In DFDS' view, the Applicant should consider and respect the views of one of its major customers, who are themselves highly experienced marine and safety professionals and the Applicant should have addressed these concerns much earlier in the process. DFDS have repeatedly informed the Applicant of what it considers is required to make the Proposed Development safe. The NRA prepared by Nash Maritime on behalf of DFDS and submitted at Deadline 2 [**REP2-043**] includes proposals as to what mitigation would be required to move all risks to As Low As Reasonably Practicable (ALARP). Though it may be a challenge to achieve consensus by Deadline 5, DFDS is willing and committed to try to achieve this.
NS.2.07	Applicant, CLdN, DFDS and IOT Operators	**Examples of any comparable Ro-Ro berths and fuel import/export berths siting relationships** Give examples of any port layouts in the United Kingdom where Ro-Ro berths and fuel import/export berths have comparable siting relationships with what is being proposed for the Port of Immingham.	**Humber Ports:** Within Associated British Ports Humber Ports (overseen by Humber Estuary Services led by ABP Harbour Master) there are three main Ro-Ro ferry (freight and passengers) operations. There are also a number also Liquid Bulk terminals within the ports along the river. Further details of the relevant Humber ports are as follows: • **Port of Hull**: P&O Ferries operate from facilities at King George Dock River berth. Hull also handles Liquid Bulk

			traffic at the specialist Saltend Jetties. These facilities are located **3,200m** apart from each other. • CLdN operate **Humber Sea Terminal** (HST) a specialist freight ferry facility for their own Ro-Ro services. Stena Line are currently also operating a RoPax (combination freight and passenger) service from there. The nearest Liquid Bulk handling facilities to HST are at two specialist berths, South Killingholme Jetty and Immingham Gas Jetty located **1,800m** down river. • **Port of Immingham**: DFDS operate out of Immingham Outer Harbour (IOH) and also within Immingham Dock. The closest Liquid Bulk operation to IOH is the Western Jetty which are 800 metres apart (as shown in Appendix 1). The Western Jetty handles approximately 500kT of cargo per year carried in c350 vessels. IOH was consented in 2004 via a Harbour Revision Order which carefully considered the compatibility of the two operations and received no objections on navigational issues. The **Proposed Development** will be sited within the major concentration of Liquid Bulk operations at Immingham Oil Terminal (IOT) and Eastern Jetty. These terminals handle fuel and chemical cargoes in varying sizes of vessels. Volumes handled are approximately 14Mt per year handled from c1100 vessels (including the largest vessels to call in The Humber as well as small coaster tankers and oil barges from the IOT Finger Piers). Ro-Ro vessels manoeuvring to/from the new

			berths at the Proposed Development would be within 95 metres of the IOT Finger Pier operations. **Other UK Ports:** The largest Port in UK is London. 7Mt pa of Ro-Ro cargo is handled at terminals in **Port of Tilbury** and CLDN's dedicated Ro-Ro operation at **Purfleet**. London handles c13Mt pa of Liquid Bulk traffic at a number of facilities. These operations are located at least 1000 metres from the closest Ro-Ro terminals. **Forth Ports in Scotland** is a major Liquid Bulk operation handling some 17Mt pa. There is a small Ro-Ro operation at Rosyth. The nearest Liquid Bulk terminal is over 9,000 metres away from Rosyth The **Port of Tees** handles 16Mt pa of Liquid Bulk traffic as well as 2Mt of Ro-Ro freight on two daily services (CLdN and P&O). The ferry terminal is located 2,500 metres from the nearest Liquid Bulk facility. Within the **Port of Liverpool**, Ro-Ro operations handle 9Mt pa of freight. Liquid Bulk volumes in the port are 11Mt pa. These are predominately handled at Tranmere Oil Terminal located 2,800 metres from the main Ro-Ro freight ferry facility at 12 Quays Birkenhead. Tranmere is 3,000m from the Ro-Ro berths within the Port of Liverpool ABP's **Port of Southampton** is one of the largest Liquid Bulk ports in the UK with over 20Mt pa of oil and associated Liquid

			Bulk cargoes handled. The main operations at the Fawley oil refinery. This operation is located 4,000 metres from the Ro-Ro operations at Marchwood on southside of River Test, and 3,000 metres from the Red Funnel Ferry Terminal on the north side of River. **Port of Belfast** ferry operations are located 460 metres from the small liquid bulk terminals on the other side of the Port. To DFDS' knowledge, other major Ro-Ro ports in the UK do not have liquid bulk cargo facilities. The busiest UK port for Liquid Bulk traffic by some way, is **Milford Haven** in West Wales. It handled 39Mt of fuel, chemicals and gases. Milford Haven Port Authority also operate the Port of Pembroke within their jurisdiction where there are regular Ro-Ro freight ferry services to Ireland. The two facilities are located 2,500 metres apart.
NS.2.10	MCA, Applicant and DFDS	**Responsibility for safe navigation** If a marine incident occurs within a port, who is ultimately responsible: ship's master; pilot; or port/harbour authority and are any spatial constraints on vessel manoeuvring a defence against culpability?	Under section 16 of the Pilotage Act 1987 the master is ultimately legally responsible for his/her vessel regardless of whether a pilot is embarked: However, in practical terms many parties share professional responsibility for a vessel's safety including the pilot who will have control of the speed and direction of the vessel in a compulsory pilotage area, the Harbour Master (and his delegated representatives in VTS), the dock master, tug skippers and berthing staff.

			However DFDS is unaware of any precedent for spatial constraints being an acceptable defence for a maritime incident. If the master determines a berth is unsuitable due to physical constraints which may be exacerbated by wind and/or current the master should decide to abort the planned arrival/departure until such conditions are more favourable. Obviously requiring such action is complex on a scheduled liner services where short sea passages and quick port turnarounds are essential for a successful service to operate.
NS.2.32	Applicant, Harbour Master and DFDS	**Use of tugs with Ro-Ro vessels** Comment on the concerns made by the IOT Operators in REP3-026 further to the Applicant's answer to ExQ NS.1.8 regarding the disadvantages or hazards inherent in using towage tugs with Ro-Ro vessels	Whilst DFDS share some of the concerns expressed by the IOT operators it is important to stress that Ro-Ro vessels can and do use tugs, especially when the weather or tide requires it. Whilst it is rare for DFDS Immingham Outer Harbour vessels to require tugs due to the slack water conditions experienced within the outer harbour, DFDS in-dock services regularly take tugs due to the strong tides experienced in the Immingham bellmouth area and the spatial constraints of port infrastructure which makes for challenging manoeuvring. The reason tugs are used less with Ro-Ro vessels, than they are with other ships with similar dimensions is: • The time taken for departures and arrivals is significantly longer when tugs are utilised; • Ro-Ro vessels are generally well specified in terms of main engines and thrusters and therefore require tugs less often;

			• The restrictions that tugs place on the ability for vessels to use main engine and bow thruster power; and • The safety implications both to the ship's crew and tugboat crew involved in every tug assisted operation. Due to the design of some Ro-Ro vessels the tugs need to operate at 45 degrees to the vessel at all times, to prevent tugs lines from being stretched across the sharp edges of the stern ramp, due to the considerable amount of stored energy in a tugs line when under strain there is a danger of 'snapback' in which a parted line recoils in opposite directions from the point of failure and has the potential to damage the ramp structure and cause injury to both the ship's crew and tugboat personnel. An example of this danger was highlighted in the MAIB's incident report regarding a fatality on the Wah Shan (2012) (see Appendix 2). The use of tugs at this angle adds extra time to arrival and departures as a vessel need to land app 30 meters prior to position or move forward 30 meters before tug can have a safe and efficient operation. DFDS has provided a visual aid to explain the use of tugs on Ro-Ro vessels, please see Appendix 3. The Applicant failed to follow this procedure in its simulations.
NS.2.33	Applicant, DFDS and Stena	**Effects arising from contingency of lack of tug availability** What would be the typical consequences if an additional tug was unavailable for a planned passage if a master during an "act of pilotage" for an arriving vessel (whether	If it is determined tugs are required for a safe arrival or departure and they are not available, it would require the vessel to wait until such tugs become available. This is obviously more complex for arriving vessels rather than departing vessels depending upon when the master and/or

		with a Humber pilot engaged or acting with the benefit of a Pilotage Exemption Certificate) determined dynamically that an additional tug would be required to make a safe manoeuvre at its commencement, having regard to the DFDS Written Representation [REP2-040] and the Harbour Master's answers to ExQ NS.1.14 [REP2-058] and NS.1.15 [REP2-059]?	pilot became aware of the delay which may require the vessel to wait in a safe location within the estuary or return to sea. For departures, issues arise when tug delays extend for a period of hours as pilots will generally disembark after a fixed waiting period and a new pilot must be ordered for the vessel which can compound the delays. Delays of any origin are potentially far reaching for a scheduled liner service as it can take several days for a service to 'catch-up' with their schedule and the associated disruption this causes to operations and customers.
NS.2.34	Applicant, Harbour Master Humber, Dock Master and DFDS	**Current direction in the approach area to the Proposed Development berths** In what way might a differential of 10 to 15 degrees in current direction between that simulated at the location of the Proposed Development berths and that identified by Interested Parties and the Harbour Master in the immediate vicinity of the Proposed Development affect towage requirements (at certain states of tide and wind) and the likelihood of and consequence of allision of a Ro-Ro vessel with a moored vessel or infrastructure at the Eastern Jetty or the adjacent tug barge?	The direction of the current is intrinsic to the safe operation of the berth, the way in which manoeuvres are conducted, and the towage requirements imposed. Although 10-15 degrees may sound minimal it would have a noticeable effect on a vessel of the size the Applicant indicates would operate at the proposed new berths. The effect of the current is then either pushing a vessel onto the infrastructure or pushing it away from the infrastructure. This is significant for the vessel in that it makes the approach to the terminal more challenging and, in particular, the manoeuvres to berths 2 and 3. It also results in greater risk to the Eastern Jetty, the Eastern Jetty Tug barge and most significantly a chemical tanker berthed at this location. However as the Applicant has failed to fully simulate berth 3 manoeuvres, having only conducted

			1 such trial, it is difficult to fully appreciate or demonstrate these dangers. There has been, understandably, much attention given to the need for adequate risk mitigation around the IOT's operations given the nature of the cargoes handled at that facility and the proximity of the IOT Finger Pier to the Proposed Development. DFDS are keen that the Examining Authority and other IP's do not lose sight of the risks associated with the Eastern Jetty given the nature of the cargoes handled there and the exposure the berth and vessels moored there would face from vessels manoeuvring to and from IERRT Berths 2 & 3. The Eastern Jetty has the capacity to handle vessels up to 213m in length and a draught of over 10m, which are much larger than the coastal vessels using the IOT Finger Pier. The nature of the cargoes handled at the Eastern Jetty include acids, benzene compounds and inorganic compounds such as caustic soda. The potential for these cargoes to cause harm to human life, marine life and ecology is potentially even greater than with the oil products handled at the IOT Finger Pier. The Applicant has failed to identify any mitigations to guarantee the safety of the Eastern Jetty. This coupled with the lack of simulation to Berth 3 is a concern for DFDS.

NS.2.47	DFDS	**MAIB reports** Submit copies of the MAIB reports cited in your Relevant Representation [RR-008] at paras 3.5.1 and 3.5.5 (incidents affecting the IOT).	Copies of the MAIB Reports relating to the following incidents (referred to in DFDS' Relevant Representation [RR-008]) are appended to this document: • Cargo Vessel Xuchanghai collides with the Aframax shuttle oil tanker Aberdeen berthed on IOT 1 (2000), please see Appendix 4; and • Coaster Fast Fillip collision with tanker berthed at IOT 1 (2015), please see Appendix 5. DFDS has also provided details of an incident in 2010 where the Fast Ann collided with the IOT in 2010, see Appendix 6.
TT.2.04	Applicant and any other IPs	**Accompanied and unaccompanied unit ratio** Has agreement been reached regarding determining an appropriate split for the handling of accompanied and unaccompanied units associated with the operation of the Proposed Development?	Progress has been made during the Transport Consultants' working groups to a point where DFDS agree that the values presented for current and future ratios are suitably justified by the Applicant for use within the overarching Transport Assessment. The Applicant clarified during the Transport Working Group discussion held on 10 August 2023, that the accompanied vs unaccompanied volume stated in the Transport Assessment [AS-008] is the anticipated future split for the intended operator (28% accompanied, 72% unaccompanied). The Applicant has also provided the first 6 months of data from Stena Lines Killingholme operations which show a slightly lower (32% accompanied, 68% unaccompanied) volume of unaccompanied movements (Applicants response

			to interested parties' deadline 1 submissions, page 15, response to ISH2 Action 14). This indicates an increase of unaccompanied proportions from current operations to future operations, this is in line with our anticipations, however the level of increase is fairly minimal particularly as the intended future sailing routes of Stena are more aligned to unaccompanied. As stated in REP2-040, paragraph 181, there is a tendency for the proportion of unaccompanied freight to grow, for which the current future state provided by the Applicant could be underestimating for a worst case analysis. As per comments made in REP3-022, paragraph 40, whilst, in isolation, the accompanied / unaccompanied split has a limited impact on the Transport Assessment, due to the variations in impacts of accompanied and unaccompanied freight units, and the uncertainty of future freight unit modes (i.e. either accompanied or unaccompanied), DFDS' recommendation remains that the range of distributions identified (i.e. current and future) is to be carried through the transport assessment in combination with all other impacts (i.e. a cumulative assessment). This should be completed as part of the revision of the Transport Assessment to correct the PCU conversion error.
TT.2.05	Applicant and any other IPs	**Tractor-only movements** Has agreement been reached regarding an appropriate allowance for tractor only movements, further to DFDS's and CLdN's representations at ISH2 that the 10%	Agreement has not yet been reached regarding the tractor-only movements. The Applicant has yet to provide justification of their basis for their 10% tractor-only assumption, which has continually been requested by DFDS

		allowance in the Transport Assessment (TA) [AS008] is insufficient.	for the applicant to provide (REP1-030 section 4, REP2-040 paragraph 176, and REP3-022 paragraph 37). It is DFDS' view that the Applicant's assessment underestimates the tractor-only number when specifically looking at unaccompanied Ro-Ro traffic. This can be clarified by the provision of further data by Stena, similar to the data that has been presented by DFDS in Table 1 of **REP1-030** (i.e. counts of truck and trailers against tractor only at the Killingholme terminal gatehouse). The Applicant has yet to provide a separate analysis for internal port movements (where the number of tractor-only movements is likely to be higher) in addition to those at the gatehouse and external to the port. Throughout all the responses provided by the Applicant, the impacts of varying the design parameters have only been considered in isolation (i.e. Tractor-only movements only, East vs West gate assignment only, not in combination). As stated throughout DFDS responses, and as captured in our Written Representation REP2-040, the Transport Assessment should be revised considering the cumulative impacts of the daily peak volume, the assignment between the West and East Gate, the number of tractor only units, and congestion on the road network (either internal within the port or external) caused by the terminal exceeding capacity. This should be completed as part of the revision of the Transport Assessment to correct the PCU conversion error.

TT.2.06	Applicant and any other IPs	**East and West Gate ratio** Has agreement been reached between the parties about the proportion of traffic generated by the Proposed Development predicted to enter the Port of Immingham via the East and West Gates?	Agreement has not yet been reached regarding the East versus West gate assignment / ratio. As per REP3-022 paragraph 42, DFDS do not agree journey time alone is sufficient to justify the heavy weighting towards the use of the East Gate, for inbound and outbound units. The Applicant has previously stated [REP1-009] that "*the location of the proposed facility immediately adjacent to the Port's East Gate would mean that a significant proportion of movements from the facility would use the East Gate. Using East Gate would be by far the most straightforward route; meaning that the majority of traffic would use this gate without any controls being imposed*." Within the Applicant's comments to Deadline 1 [REP2-010], the Applicant contradicted this statement by stating that the Applicant is in discussion with National Highways and the Council about upgrading wayfinding and identified the proposed introduction of operational management measures with drivers. These upgrades to way finding and operational modifications have not been secured within the DCO, have not been assessed within the Transport Assessment, and have not been presented to the interested parties for review so it is unclear to DFDS as to what these measures actually entail. The Applicant has also stated that '*The majority of demand for those movements (as set out in the TA [AS-008] at Table 12) is longer distance movements and there is no reason why these movements would want (or indeed need) to stop*

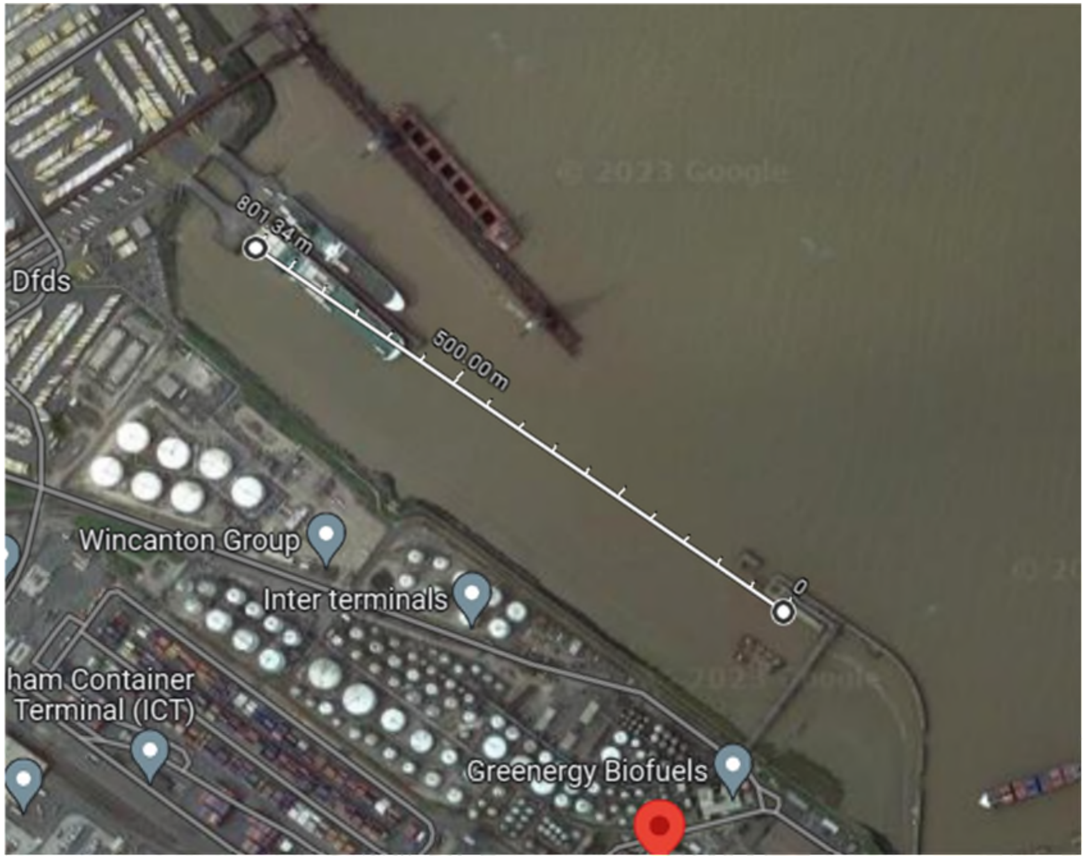
			locally'. DFDS disagrees with this statement as discussed in REP3-022 paragraph 45. The Applicant and interested parties have agreed to develop a map of the local depots, distribution centres, warehouses and other logistic facilities as part of the transport working group to provide some evidence regarding the likely potential of local facility use. The Applicant's assessment currently risks underestimating local movements on the road network and drivers for East versus West gate selection as discussed within DFDS Written Representation REP2-040. In addition, as per previous responses to the Examiners Questions provided above, a cumulative assessment has yet to be completed considering all applicable variables. As requested by the ExA at ISH3, DFDS are now working (as part of the Transport Working Group meetings) on defining the current capacity of the West Gate, East Gate and local road network junctions to identify the tipping point as to when mitigations may be required in respect of the East versus West Gate distribution ratio. This information should be ready for incorporation within Deadline 5 deliverables. In addition to the East versus West gate ratio, there is another significant factor leading to the need for mitigations at the gate houses and on the port / local road networks. As discussed at ISH3, DFDS has identified an error within the current Transport Assessment's methodology in that the conversion of existing and committed development heavy goods vehicle traffic has not been converted from vehicle

			counts to PCU's for modelling correctly, and therefore underestimates the current and committed development traffic levels. The Applicant, in response to questions raised by DFDS' transport consultants, during the transport working group have now provided a high level summary of the vehicle count to PCU conversion implications (although this is yet to be provided to the Inspectorate and DFDS request that this is done). DFDS are still in the process of reviewing the summary provided by DTA, however at a high level what it shows is that the network is already highly congested (rather than the initial position of having a level of capacity on the network) and is sensitive to any additional demand being applied. It is DFDS' recommendation that the review of the gates and junctions capacity should be completed as part of the revision of the Transport Assessment to correct the PCU conversion error.

DFDS Response to ExQ2

Appendix 1 – Image showing the distance of 800m between the Western Jetty and Immingham Outer Harbour

Appendix 1- Image showing the distance of 800m between the Western Jetty and Immingham Outer Harbour



DFDS RESPONSE TO ExQ2

APPENDIX 2

MAIB REPORT - WAHSHAN

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

ACCIDENT REPORT

VERY SERIOUS MARINE CASUALTY — REPORT NO 18/2013 — JULY 2013

Extract from The United Kingdom Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of such 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 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

All reports can be found on our website:
[redacted]

For all enquiries:

Email: maib@dft.gsi.gov.uk
Tel: 023 8039 5500
Fax: 023 8023 2459

Fatal injuries to a crewman while securing a tug's tow wire on board the bulk carrier *WAH SHAN*

River Humber
2 October 2012

SUMMARY

At about 0712 on 2 October 2012, the carpenter on board the capesize[1] bulk carrier *Wah Shan* was struck by a messenger line while he was attempting to secure a tug's tow wire in preparation for the vessel berthing. The coastguard advised that the quickest means of evacuating the casualty was for the vessel to carry on and berth as soon as possible. *Wah Shan* berthed at Immingham at 0804 and a paramedic boarded immediately to examine the carpenter, Mr Wang Ji-Yue. Mr Wang Ji-Yue was pronounced dead at 0815. The post-mortem report concluded that he had died from a fractured neck.

The investigation found that: the risks involved in securing the tug's tow wire had not been properly considered; the aft mooring party used poor seamanship practices and did not function as an effective team; and the configuration of the aft mooring deck did not provide an obvious method of heaving up the towline safely. The factors resulted in the crew adopting an unsafe method for heaving the tow line on board, which ultimately resulted in the fatal injury to the carpenter.

Wah Shan's managers have taken a number of positive actions to help prevent a similar accident from recurring. They have also been recommended to improve their training programmes to develop good seamanship practices and leadership skills. The International Chamber of Shipping has agreed to promulgate a safety flyer based on this report to its members to help improve awareness of the safety issues. The MAIB has written to the shipyard where *Wah Shan* was built, to encourage the designers there to review and improve the mooring arrangements on future vessels of this type.

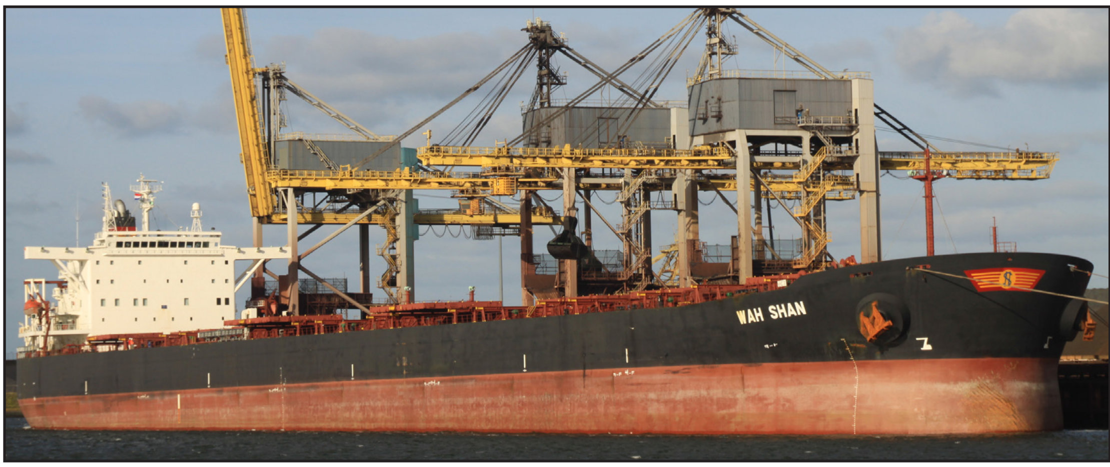


Image courtesy of Willem Oldenburg

[1] Capesize is the term normally used to define the size of large bulk carriers in excess of 100,000 dwt.

FACTUAL INFORMATION

Narrative

Wah Shan departed Ijmuiden in The Netherlands at 2300 on 30 September 2012. At 0430 on 2 October, two pilots working on behalf of Associated British Ports, Immingham, joined the vessel at the Humber light float. The vessel navigated up the River Humber on her approach to Immingham and at 0630 the master announced arrival stations using the public address system. The carpenter was the first to arrive at the aft mooring station, followed by the second officer, a welder, an oiler and a wiper. At 0655 four tugs arrived at Sunk Spit Buoy to meet the vessel and assist it to berth alongside. Two tugs, one forward and one on the starboard shoulder, were made fast by a team of seven deck crew at the forward mooring station. A third tug stood by at the starboard quarter and the twin-unit Voith Schneider tug, *Alma,* approached stern-first towards *Wah Shan*'s stern **(Figure 1)**.

As preparations were made to connect the tug's tow wire, *Alma* and *Wah Shan* were positioned stern to stern maintaining an approximate speed of 6.4 knots through the water. *Alma*'s skipper and chief engineer were in the wheelhouse and the mate was on the aft deck. The chief engineer operated the winch for the tow wire and the skipper was in charge of navigation. *Wah Shan*'s deck was approximately 13m above the tug's deck and it was not possible for the crew in *Alma*'s wheelhouse to see what was happening on *Wah Shan*'s aft mooring deck.

At around 0700, *Wah Shan*'s carpenter lowered the ship's messenger line through the aft centreline Panama fairlead to *Alma*. The mate of *Alma* received the line and tied it to the tug's messenger line which was attached, in turn, to the steel tow wire. The aft mooring team on *Wah Shan* took up the slack in the messenger lines and attempted to heave up the tow wire by hand. *Alma*'s mate realised what *Wah Shan*'s crew were trying to do and he indicated to them, by shouting and using hand gestures, to use a winch to heave up the tow wire.

The carpenter passed the messenger lines through the aft centreline bitts and then diagonally across the deck, past the inboard side of the starboard winch, to a pedestal fairlead which was forward of the winch. He then passed the messenger line around the pedestal fairlead so it led off the outboard side of the fairlead to the warping drum **(Figure 2)**. He then piled the free end of the

Reproduced from Admiralty Chart BA 1188-0 by permission of the Controller of HMSO and the UK Hydrographic Office

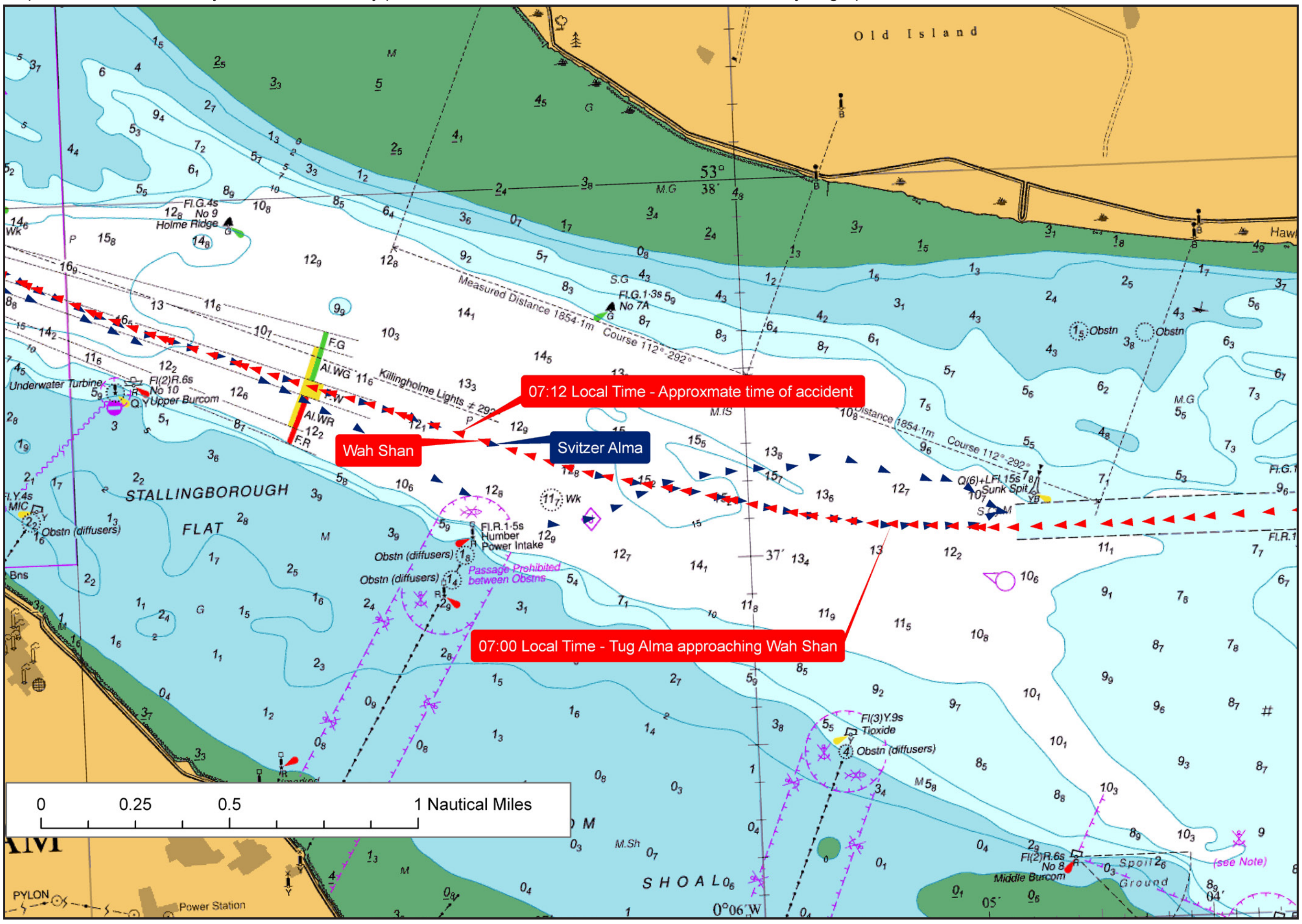


Figure 1: Tug *Alma* and *Wah Shan* approaching Immingham

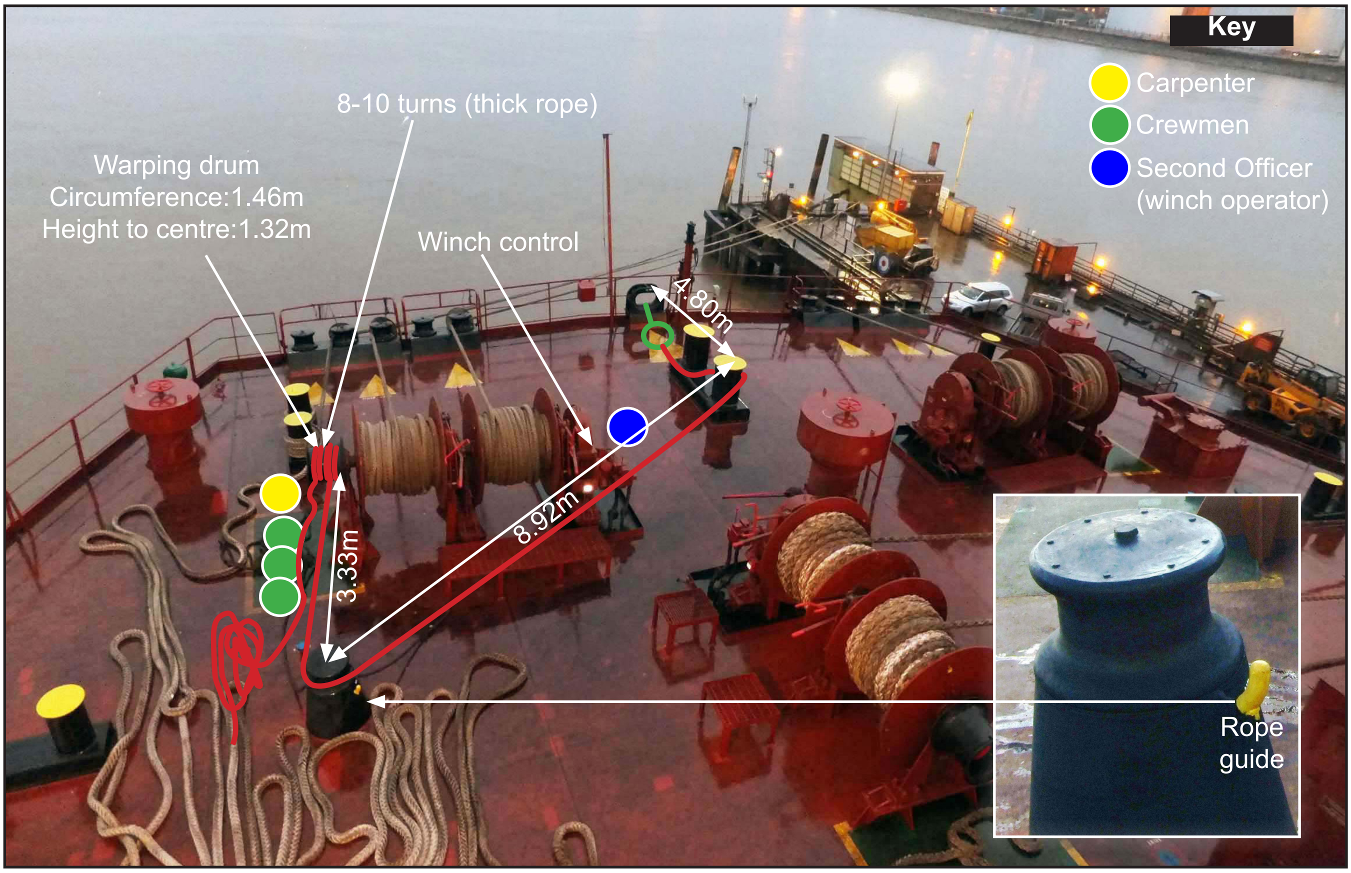


Figure 2: Layout of mooring equipment and messenger line routing at the time of the accident

messenger line on the deck between the pedestal fairlead and winch and heaved it in by hand until all the slack line was taken up. Finally, the carpenter turned up the messenger line onto the warping drum, winding it on to the drum from the underside and leading it back towards the pedestal fairlead. The welder operated the winch controls, which were located at the opposite end of the winch (on the inboard side) to the warping drum. When standing at the winch controls, the welder could not see the carpenter due to the rope guards on the winch's main drums. The second officer stood at the aft railing to watch the tow wire as it was heaved up, while the two engine room ratings stood by to help secure it.

The carpenter had taken approximately eight to ten turns of the messenger line around the drum; and these turns accumulated towards the outboard end of the drum as it rotated due to the angle of the lead from the pedestal fairlead. The free end of the messenger line then became entangled in 'riding turns'[2], causing it to be heaved back into the warping drum with the part under tension. As this was happening, the tow wire came up onto *Wah Shan*'s deck and the towing eye nearly reached the aft bitt. As heaving continued, the messenger line slipped off the side of the warping drum causing the tow wire to drop back down towards the tug. The messenger line slipped off the side of the warping drum on at least four occasions, with the eye of the tow wire sometimes dropping all the way down to the gunwale of the tug. This prompted the tug skipper to call *Wah Shan*'s pilot using the very high frequency radio (VHF) to enquire if there was a problem with securing the tow wire.

Between 0705 and 0710, in response to the call from the tug, one of the pilots went to the starboard aft side of the bridge deck to check the mooring operations. Seeing that the messenger line was tangled up and twisted as it led onto the warping drum, he immediately returned to the bridge and asked the second pilot to have a look.

At around the time the first pilot was entering the bridge, the messenger line slipped off the drum again. The welder stopped the winch and went around to the drum side to investigate what was happening. Seeing the tangled condition and the build-up of the line on the outer end of the warping drum, he advised the carpenter to remove the messenger line from the warping drum and start again. The carpenter insisted on carrying on as

[2] A line is normally led onto a warping drum and sufficient turns taken (normally about three) so that there is enough friction for the rotating drum to pull the tensioned line. The free, or slack, part of the line should then be led away from the drum in the opposite direction and coiled down neatly well clear of the tensioned part. If the slack part of the line becomes tangled, or is trapped underneath the tensioned part it continues to rotate and is pulled back onto the warping drum. This is referred to as a 'riding turn'.

before, and persuaded the welder and the two engine ratings to help him push the messenger line further onto the body of the warping drum. The second officer took over the winch control and started heaving very slowly. By this time, the carpenter was standing with his head a few centimetres away from the drum. Suddenly he was heard to cry out. The second officer stopped the winch and quickly moved around to the drum end. There, he found the carpenter slumped forward on the messenger line with a loop of rope hanging loosely around his neck. The crew members removed the loop and gently laid the carpenter on the deck. At 0712, the second officer informed the master about the accident using his ultra high frequency radio.

Meanwhile the second pilot, who was as yet unaware of the accident, had moved to the aft side of the starboard bridge deck. He saw a crew member lying on the deck and asked the master, who was already standing there, if he knew what had happened. The master told him that there had been an accident and emulated a slashing action across his neck with his hand.

The casualty was tended to by one of the crew members while the others secured the tow wire using the port winch, assisted by a team from the forward mooring station that had arrived to help. The casualty was moved to a stretcher and prepared for evacuation, during which time he showed no signs of life. The pilot on the bridge called the local coastguard by VHF radio and requested assistance. The coastguard informed the pilot that it would take up to 50 minutes for the helicopter to arrive[3] and a decision was taken for the vessel to berth as soon as possible and evacuate the casualty once alongside. Meanwhile, the carpenter was covered with blankets and made comfortable.

At 0804, *Wah Shan* came alongside, where an ambulance team was waiting. After examining the carpenter, the paramedic declared him deceased at 0815. The post-mortem report stated the cause of death to be *fracture dislocation of the cervical spine*[4].

[3] Between 0800 and 2200, the search and rescue helicopters operate on 15 minutes notice to mobilise and on 45 minutes notice outside these hours.

[4] Cervical spine is the anatomical term for neck.

Ship manager

Wah Shan was one of seven bulk carriers managed by the Sincere Navigation Corporation, based in Taiwan. Of the seven vessels, five were 'capesize'.

Crew

There were 23 crew members on board *Wah Shan*. The master, chief officer, chief engineer and second engineer were from Taiwan; the rest of the crew were from the People's Republic of China. The working language on board was Mandarin.

The deceased, Mr Wang Ji-Yue, was 35 years old and reputed to have been a hard working and responsible crew member. He was qualified as an able bodied seaman capable of being part of a navigational watch (STCW[5] II/4). He joined Sincere Navigation in February 2012 as an ordinary seaman on board *Wah Shan* and was subsequently promoted to the role of carpenter in June 2012. He had previously been employed as bosun and carpenter in other companies. At the time of joining, and again after his promotion, Mr Wang Ji-Yue had signed an '*Elementary Basic Safety Familiarization Checklist*' and a '*Specific Shipboard Familiarization Checklist*' which included familiarisation with mooring equipment. He was well rested and was wearing appropriate personal protective equipment including helmet, gloves and safety boots at the time of the accident. He was 1.69m tall.

The master had joined the vessel in February 2012. He was 64 years old and had 12 years' experience as master, having joined Sincere Navigation as a third officer in 1984. He had a limited command of the English language.

The second officer was 31 years old and held STCW II/1 Certificates of Competence issued by the administrations of the People's Republic of China and the Republic of Panama. He had joined the vessel in October 2011 and kept the midnight to 0400 and noon to 1600 watches at sea. On the day of the accident he had slept about 2 hours before the accident and had 6 hours rest the previous evening. He reported that he did not feel unduly affected by fatigue on the morning of the accident.

The chief officer was responsible for the forward mooring station and the second officer for the aft mooring station. The forward and aft mooring teams always comprised the same crew members. In addition, two deck ratings were assigned to

[5] STCW: International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.

rigging the accommodation ladder and gangway. Except for the engine ratings, all the members in the aft mooring team had completed the mooring winch familiarisation programme. This concentrated on the operation of the winches and did not cover securing tow wires or heaving in messenger lines.

Mooring and towing arrangements

There were three Rauma Brattvaag (Rolls Royce) hydraulic mooring winches on *Wah Shan*'s aft deck: one on each side and the third just to the starboard side of the centreline. Snap back zones were marked at all the fairleads around the edge of the deck. Each winch had a warping drum and two drums for storing mooring ropes. One of the hydraulic pipes connected to the starboard outer winch showed signs of chafing. A reconstruction of the lead used for the messenger line indicated that the chafing was consistent with the messenger line rubbing against the pipe **(Figure 3)** as it passed from the centreline bitts to the pedestal fairlead. The hydraulic pipes on the port winch also had minor chafing marks. Steel platforms were provided by each winch so that crew could reach up to apply the brakes.

The messenger lines from both *Wah Shan* and *Alma* were identical 38m long, 32mm diameter polypropylene ropes. *Alma*'s steel tow wire was 44mm in diameter and weighed 7.8 kg/m. While the use of steel wire ropes is common, a significant number of tugs use towlines made from synthetic fibre. These materials are significantly lighter than a steel wire of equivalent diameter and strength and therefore can often be heaved in by hand. *Wah Shan*'s centreline bitts were fitted with a loop to which a stopper[6] could be attached. A stopper was not rigged during the first attempt to heave up the tow wire prior to the accident. Following the accident, a stopper was rigged, and it was used successfully during the second attempt to secure the tow wire.

From February 2012, when most of the current crew members had joined *Wah Shan*, stern tugs had been used around 20 times when the vessel arrived at or departed from ports. The winches had been used to lift up the tow wire of stern tugs on only three or four of these occasions. Of the remainder, the tow wires were physically lifted up by the mooring team, often helped by the crew members who were assigned to rig the gangway.

Shortly after the accident, *Wah Shan*'s master in consultation with marine surveyors acting on behalf of the ship owner produced a sketch showing what he considered to be a better alternative method of heaving in a tow wire **(Figure 4)**. The designated person ashore (DPA) from Sincere Navigation carried out an investigation on board after the accident and produced a different plan showing the method that he thought to be 'correct' **(Figure 5)**. The forward mooring and towing arrangements were more simply arranged and are shown in **(Figure 6)**.

MAIB inspectors went on board a randomly selected bulk carrier arriving at Immingham to study the process used to secure a tug aft. The selected vessel was a Panamax[7] size bulk carrier and the tug *Alma* was in attendance. The mooring equipment on this vessel was well positioned, making it readily apparent how a messenger line should be led from the centreline fairlead to the warping drum. The entire operation, beginning with sending a heaving line to the tug and ending with the eye of the towing pennant on the bitts, took less than 5 minutes. The mooring equipment on the bulk carrier's aft deck is shown in **(Figure 7)**.

Safety management system

Wah Shan's safety management system (SMS) documentation was provided on board in both Mandarin and English languages. The system required an '*operational risk check list*' for deck operations to be completed by the chief officer, for engine operations by the the chief engineer, and by both for combined deck and engine operations. It also required the master to confirm that risk control procedures were appropriate and to ensure they were in place during the operations.

Surveyors from the Maritime and Coastguard Agency (MCA) carried out a Port State Control Inspection on *Wah Shan* shortly after the accident. Several deficiencies were recorded, including one which noted that an operational risk checklist for joint operations by the deck and engine departments was not available on board at the time. The MCA surveyors asked the master to search for the document, and the master confirmed that no such document had been produced for the mooring operation. The DPA's subsequent accident investigation report included a completed

---

6 A stopper is used to take the strain off a wire or rope to allow the free end to be attached to the bitts. The stopper normally consists of a length of chain or rope (other types with special grips or chocks are also available), secured to a strong loop at the base of a set of bitts. A chain stopper is then crossed over the wire so that there is enough friction to grip the wire.

7 The largest size vessel which can transit the Panama Canal – smaller than capesize vessels.

Figure 3: Chaffing marks on hydraulic pipe of starboard winch

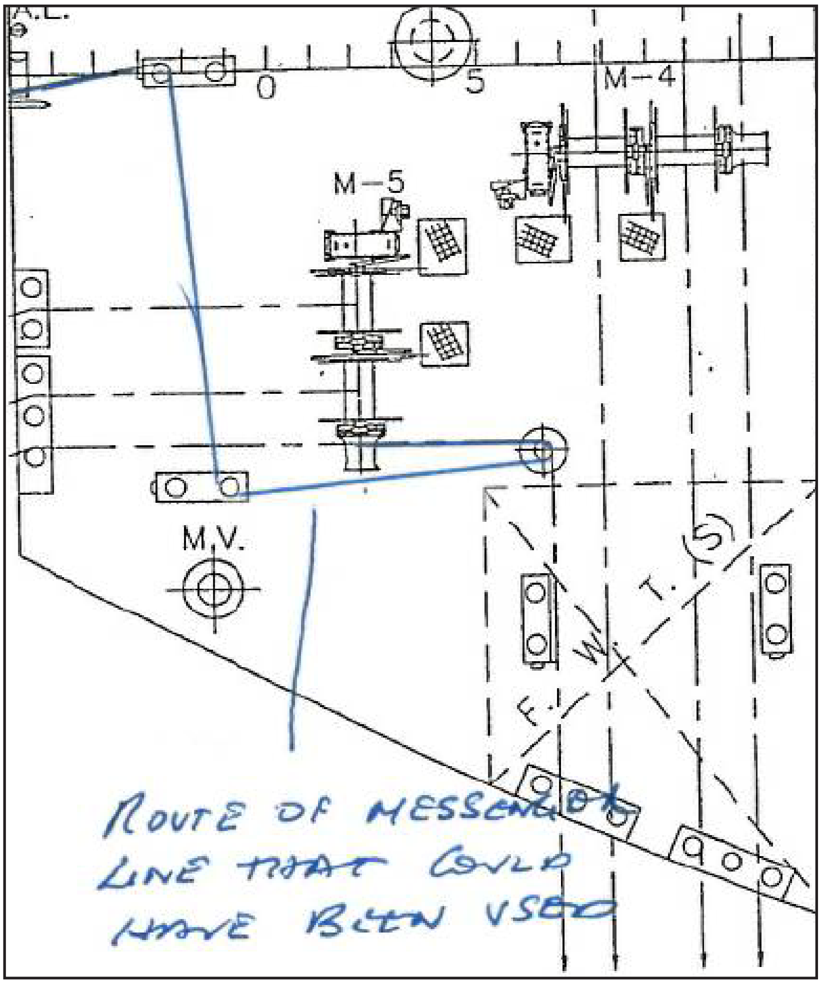


Figure 4: Initial suggestion for an alternative method to take the towline

Figure 5: DPA's suggestion for the 'correct' method to take the towline

Figure 6: Forward mooring arrangement on *Wah Shan*

Figure 7: Aft mooring deck on a bulk carrier visited by MAIB

copy of a risk checklist for the mooring operation dated September 2012, signed by the master, chief officer and bosun (who was nominated as the 'person in charge').

Guidance on best practice

'*Mooring Equipment Guidelines*', a widely used textbook published by the Oil Companies International Marine Forum (OCIMF), recommends that fairleads and warping drums should be located such that the fleet angle[8] does not exceed 1.5º. The publication states that a ship's mooring equipment should be designed for diverse requirements including mooring in port, single point moorings, multi buoy moorings, tug handling and barge mooring; therefore, all possible line leads for the various requirements must be considered. In the section 'Requirements for tug handling', the book states that there should be suitable equipment for hauling the tug's line on board, '*to lead the heaving line onto the warping head of a mooring winch*' using, '*suitable pedestal fairleads, guide posts or bollards.*'

[8] The 'fleet angle' describes the orientation of a line as it leads onto a rotating drum. Ideally a line should be lead onto a drum at right angles to the axis of the drum. The fleet angle is the angle between an imaginary line at right angles to the drum's axis and the line itself. If the fleet angle is too great, the line will not lead onto the drum evenly and will gather at one end, potentially causing the line to snag or be dragged off the end of the drum.

The OCIMF publication '*Effective Mooring*', provides eight safety reminders to crew who are working with synthetic mooring ropes. These are:

1. *Do not surge synthetic ropes on the drum end … it may stick to the drum or bitt and jump …*
2. *Do not stand too close to a winch drum or bitt when holding and tensioning a line … Stand back and grasp the line about one metre from the drum or bitt*
3. *Do not apply too many turns over the warping drum end …*
4. *Do not bend the rope excessively*
5. *Do not stand in the bight of a rope*
6. *Do not stand close to a rope under load*
7. *Do not leave loose objects in the line handling area*
8. *Do not have more people than necessary in the vicinity of a line*

The MCA's publication, '*Code of Safe Working Practices for Merchant Seamen* (COSWP)' was referred to in *Wah Shan*'s SMS as a source of additional information. Regarding the attachment of a tug's tow wire, COSWP states:

'A messenger should be used to heave the tug's tow wire on board by a winch, and then a stopper used while the eye is placed around the bollard. Only enough turns of the messenger should be used on the warping drum end to heave in the tow wire.'

Team work and the use of design to prevent accidents

In a publication sponsored by the MCA, '*The Human Element: a guide to human behaviour in the shipping industry*', (2010, Dick Gregory and Paul Shanahan), the authors indicate that violation of established rules is typically due to three different reasons:

- When people attempt to solve a novel, but immediate problem using limited knowledge and experience.
- When people resort to short-cuts which have proved effective in the past.
- When supervision is ineffective.

The authors quote established research in the subject of team skills, stating that there are five main team skills:

- Team leadership, which includes the ability to direct, coordinate and motivate team members, as well as engaging with them in planning and feedback sessions;
- Team members' ability to monitor each other's performance;
- Supportive behaviour of team members, who are proactive in their understanding of others' tasks and willing to share some of the load if necessary;
- Adaptability, or the ability for team members to respond to external changes and modify their own work accordingly, and;
- Team orientation, or the degree to which team members see the team's goal as their own.

The publication '*The engineer's view of human error*' by Trevor Kletz, a fellow of the Royal Academy of Engineering, states:

We can, of course, change people's performance by better training and instructions, better supervision and, to some extent, by better motivation. What we cannot do is enable people to carry out tasks beyond their physical or mental abilities or prevent them making occasional slips or lapses of attention. We can, however, reduce the opportunities of such slips and lapses of attention by changing designs or methods of working.

Voyage Data Recorder

Wah Shan's voyage data recorder (VDR) was manufactured by the Japan Radio Company (JRC) Limited. It was serviced, and had its annual performance test (APT) certificate issued, at Ijmuiden on 28 September 2012. The VDR service engineer reported that the system was operational when he left the vessel at around 1500 UTC.

During the APT, the service engineer remarked that the expiry date for the reserve power battery was June 2012; an order for a replacement was placed with JRC with the intention that the new battery would be fitted when the vessel called at Immingham. As part of the APT, the service engineer switched off the mains power supply and noted that the battery power was switched off automatically after 2 hours of recording. This test established compliance with the performance requirement standard for VDRs (IEC61996-1[9]). The service engineer was unable to test the write mechanism for archiving the VDR data as neither he nor the crew had an appropriate recording disc available. He used his laptop to extract data directly from the VDR.

Wah Shan's crew members received and fitted the new battery on 2 October after the vessel had arrived alongside at Immingham. The MAIB examined the data stored on the VDR's hard drive disk. No data had been recorded between 2022 UTC on 28 September and 1633 UTC on 2 October. The DVD RAM[10] write mechanism of the VDR was found to be defective and there was no evidence to establish that it had ever worked.

Regulation 18 of SOLAS Chapter V, '*Approval, Surveys and Performance Standards of Navigational Systems and Equipment and Voyage Data Recorder'* states that during the APT, the accuracy, duration and recoverability of the recorded data should be verified. IEC61996-1 states:

'Means shall be provided to ensure that the recorded data may be saved by an appropriate method following an incident …'

---

[9] International Electrotechnical Commission (IEC) standard 61996-1.

[10] DVD RAM Digital Versatile Disc Random Access Memory.

On 29 September 2012, the American Bureau of Shipping (ABS), *Wah Shan*'s classification society, issued the annual 'cargo ship safety equipment certificate' confirming that the vessel's VDR met the required standards.

Previous fatal accidents in similar circumstances

Since 1992, five fatal accidents have been reported to the MAIB that have been caused by tow wires and messenger lines during the process of securing a tug to a ship.

- In 1992, the chief officer on board the dry cargo vessel *Ocean Express* was killed by a whiplash injury to the neck caused by a parted messenger line
- In 2007, a crew member on the tug *Retainer* suffered a fatal whiplash injury to his chest as the tow rope, which had snagged on the mooring equipment, suddenly released.
- Similar accidents on the refrigerated cargo vessel *Ice Bird* (2002) and the tug *Englishman* (2008) killed two crew members.
- In 2009, a crew member from the container vessel *Ever Smile* was killed when he was struck by a messenger line which had jumped off the warping drum causing him to fall overboard.

ANALYSIS

Fatigue, drugs and alcohol

There was no evidence to suggest that the effects of fatigue, drugs or alcohol contributed to this accident. Although the second officer had only two hours of rest after his watch on 2 October, he had rested well during the previous evening and reported that he did not feel unduly tired. His behaviour on the morning of the accident was not considered to be due to fatigue. The post-mortem examination of Mr Wang Ji-Yue found no evidence of recreational drugs or alcohol in his system that might have impaired his performance at the time of the accident.

The accident

A significant amount of energy would have been stored in the polypropylene messenger line due to the weight of the tow wire and the friction as the messenger line led through the bitts resisted the tension created by the warping drum. In addition, the line would have been twisted each time a turn of rope slipped off the warping drum. The riding turns which accumulated on the warping drum would have created a complicated system – some turns would be trapped by their neighbours so that they were not under tension; other turns that were not trapped might experience the full amount of tension in the line. Any twist in a particular section of line might have caused a bight of rope to rotate rapidly as it came off the warping drum.

During the accident, it was considered likely that one or more turns of the messenger line came off the warping drum in such a way that these forces were suddenly released, forming a bight that rapidly uncoiled in a whiplash action. Given that the height of the drum above the deck was 1.55m, Mr Wang Ji-Yue's neck would have been adjacent to the upper part of the warping drum. The post-mortem report stated that he had suffered a fractured neck. Hence, it is almost certain that Mr Wang Ji-Yue was fatally injured when a section of the tensioned messenger line slipped off the end of the warping drum and struck him on the neck.

It was considered very unlikely that Mr Wang Ji-Yue's injuries were caused by him being dragged into, or around, the warping drum even though a loop of the messenger line was found around his neck. The loop was much more likely to have been a bight formed in the part of the messenger line that had been trapped under the riding turns and isolated from the section which was under tension. Also, a bight of rope rotating as the warping drum turned would not have contained sufficient energy to inflict such a serious injury so rapidly.

There was no evidence to suggest that the actions of the stern tug *Alma* contributed to the accident in any way. The tug crew maintained sufficient slack in the tow wire by matching *Wah Shan*'s course and speed, and, by paying out the wire from their winch as necessary.

Seamanship

The crew members at the aft mooring station on *Wah Shan* attempted to heave in *Alma*'s steel tow wire by hand, and they only stopped when they were advised against doing so by the tug's crew. Apart from lifting the weight of the wire from the tug up to the stern of *Wah Shan* (at least 100kg), there would also have been a considerable amount of friction as the wire passed through the stern fairlead and onto the centreline bitts. It would have required the co-ordinated effort of several people to heave in the steel tow wire successfully and without injuring anyone. There was also the risk that any relative movement between *Alma* and

Wah Shan could have suddenly put extra weight onto the messenger line, injuring anyone handling it at the time. Although there was no evidence to suggest that the towline came under a sudden load in this instance, several other accidents have occurred when lines have come under tension quickly. Tow lines made from synthetic fibre are significantly lighter, so that it is possible for one or two crew members to heave them in; however, the practice of heaving in heavy steel wires by hand should be avoided.

It is considered unlikely that *Wah Shan*'s second officer would have allowed his team to attempt heaving in the steel tow wire by hand if he had properly understood and assessed the risks of the operation.

Once the aft mooring team decided to use the starboard winch to heave up the tow wire, they chose, and then persisted with, an unsuitable lead for the messenger line. The messenger line not only damaged the winch's hydraulic pipes, but also led onto the pedestal fairlead from the wrong direction. The pedestal fairlead was designed to assist in taking a breast or spring mooring line from ashore, with the line exiting from the pedestal on its inboard side. If it was used in this way, the line would lead onto the winch at a suitable fleet angle. There was also a rope guide positioned on the pedestal to support any slack lines when it was being used in this configuration **(Figure 2)**. Routeing the messenger line around the pedestal fairlead from the inboard to the outboard side caused it to have a lead angle onto the warping drum of more than 1.5º. This made the messenger line accumulate at the outer end of the warping drum as it rotated. In this state, the messenger line was far more likely to develop riding turns and, or, slip off the outer edge of the warping drum.

The aft mooring team did not follow the recommended practice of taking only sufficient turns on the drum to get traction (normally 3-4 turns), and backing up the tail of the messenger line as it payed off the drum. Instead, they decided to take up to 10 turns of the messenger line on the warping drum, effectively using the drum like a winch to wind up the messenger line until the eye of the tow wire was a short distance away from the bitts[11].

[11] As the circumference of the drum was 1.46m, taking 10 turns on the drum would have lifted the tow wire between 14m and 15m; *Wah Shan*'s deck was about 13m above *Alma*'s deck.

Once the eye of the tow wire had been heaved up to the bitts, some method would have been needed to hold the wire safely while the eye was manhandled over the bitts. This would normally be done by holding the wire with a stopper. However, a stopper was only rigged during the second attempt to attach the tow wire, after the accident. That a stopper had not been rigged before the messenger line was taken to the warping drum was another indication that the aft mooring crew had not given enough thought to carrying out their task.

The free end of the messenger line was heaped between the pedestal fairlead and the winch, rather than being led away behind the winch in the normal manner. The combination of this arrangement and the number of turns on the warping drum considerably increased the likelihood of the free end being caught up in 'riding turns' and dragged back into the turning drum.

One of the reasons why the carpenter was reluctant to remove the messenger from the warping drum when the welder challenged him was because he might have believed that only one or two more rotations of the drum would be needed to complete the task. Unfortunately, in persisting with a hazardous working method and positioning himself so close to the drum, he placed himself in an extremely dangerous situation.

The aft mooring team showed a worrying absence of basic line-handling skills. The Sincere Navigation Corporation's senior officers and managers should take urgent action to ensure that all crew members have the necessary standard of competence.

Teamwork

The crew at the aft mooring station did not function as a cohesive team; many, and perhaps even all, of the elements that have been described as being necessary for effective team behaviour were missing. Further, the crew did not follow generally accepted safe working practices.

It was apparent that there was little or no planning before the task; the crew expected to be able to heave up the steel tow wire by hand. There was no remedial planning when the situation changed and the crew were effectively faced with a novel, but immediate problem. The layout of the aft mooring deck did not offer any obvious solutions to the problem of leading the messenger line to a warping drum and, without guidance, the crew were obliged to improvise. It is understandable how the crew might have considered that the operation posed little risk – a task that would have been done by hand was now being made easier by using a machine.

The second officer did not direct his team; he took little part in deciding how the tow wire should be heaved in, or how his team should deal with the problem. Consequently, there was little consideration of the hazards, no pre-task briefing, and therefore no shared plan of how to deal with them. The crew's attempts to monitor one another were therefore compromised as they did not have a common understanding of what should have been happening. The only exception was the welder, who tried to persuade the carpenter to remove the messenger from the warping drum and start the operation again. Sadly, he did not receive any support from the other members of his team and his attempted intervention was undermined by the second officer moving to operate the winch. It was possible that the carpenter was not confident that a meaningful solution would emerge by discussing the problem with his teammates, three of whom were not experienced deckhands. His method for heaving in the tow wire, while unorthodox, appeared to be working and was therefore endorsed as being a reasonable solution. The practice of pushing the messenger line back onto the rotating drum rather than stopping the operation, also appeared to be successful – an obvious shortcut therefore seemed to be condoned and reinforced.

It is doubtful whether any of the aft mooring crew on *Wah Shan* considered the team's goal as their own. They did only what they were asked to do and did not provide any other constructive help that morning. It is therefore not surprising that the carpenter felt compelled to act unilaterally.

Leadership

The second officer demonstrated very poor leadership immediately prior to the accident as he deferred to the wishes of the carpenter, despite witnessing the repeated slipping of the messenger line. He was the officer-in-charge of the operation and had the responsibility for the safety of his team. Further, he had the authority to stop and review the operation at several junctures:

- When he saw the convoluted path chosen by the carpenter to route the messenger line from the centreline bitts to the warping drum **(Figure 2)**.
- When an excessive number of turns of the messenger line was placed on the warping drum in order to heave in the tow wire.
- When the turns of the messenger line bunched up and slipped off the warping drum several times.
- When the tangled mass of slack messenger line was caught by riding turns and dragged into the rotating warping drum.
- When the carpenter asked other crew members to push the messenger line back onto the warping drum.

Despite these clear indicators of poor line-handling practice, the second officer continued to act in deference to the carpenter's wishes, to the extent that he took the place of the welder to operate the winch. Even just before the accident, he could have ordered that a stopper be used to hold the messenger line or tow wire while the tangle of rope around the area of the warping drum was cleared away.

It is considered likely that the second officer lacked the confidence to challenge his team when the operation changed and again when it started to go badly. It is also quite likely that he did not have sufficient knowledge or experience in securing a tug's tow wire using the winch; the operation had generally been carried out by hand during his time on board *Wah Shan*.

The second officer's leadership skills were demonstrably ineffective; he lacked the knowledge and experience to carry out his supervisory role effectively. Consequently, it is understandable why the carpenter might not have wanted to consult the second officer or his colleagues and instead launch straight into the task. It is therefore vital that ship managers and senior officers ensure that their crews have effective leadership and team working skills. They should also ensure that their crews are equipped with the knowledge, familiarity and competence to carry out their jobs safely.

Implementation of the safety management system on board *Wah Shan*

Wah Shan's SMS contained clear instructions for the crew to carry out risk assessments for all potentially hazardous activities. Although a risk assessment for mooring operations had been signed as being completed in September 2012, the risks pertaining to securing tow wires had not been considered. Moreover, none of the three signatories to the risk assessment for mooring operations had ever been part of the aft mooring team. While most of the guidance that was available for handling mooring lines was also applicable to securing tugs' tow lines, it is still very important to consider the specific risks associated with securing a tug's tow wire to a ship while both are in motion. A thorough assessment of securing a tug's line at the aft mooring station should have identified that the method of leading a messenger line onto a winch was unclear and needed to be defined.

The actions of the aft mooring team on *Wah Shan* immediately prior to the accident contravened most of the available guidance on safe and effective mooring. Particular examples of this were: standing too close to the warping drum, applying too many turns of rope around the warping drum, standing too close to a rope under load, cluttering the line-handling area with the excess rope, and four people standing in the vicinity of the tensioned messenger line. While much of this can be attributed to the competence of those involved, the performance of the team as a whole was a significant factor. On *Wah Shan*'s aft mooring deck, poor practices were endorsed, and when safety concerns were raised they were overruled.

To overcome these problems it is important that *Wah Shan*'s managers make a fair and accurate assessment of how their crew operates as a team. This must be done in order to understand the underlying reasons why the aft mooring crew behaved as they did prior to the accident. More importantly, this knowledge should then be used to change crew attitudes and improve future performance.

Irrespective of rank, crew members should be encouraged to spot hazards which might not have been identified during a written risk assessment. Most significantly, managers and crew must understand that the primary purpose of risk assessments is to prevent accidents on board and not merely to satisfy regulatory requirements.

Arrangement of the aft mooring deck equipment

The arrangement of the equipment on the aft mooring deck of *Wah Shan* did not provide an obvious safe method of using a winch to heave in a tug's tow wire through the centre lead. This was reflected in the two different methods proposed independently by the master and the DPA after the accident. While both these methods were an improvement on the attempts made on the day of the accident, they were both complicated. This complexity increased the potential for error.

It was immediately apparent from the layout of the equipment on the foredeck of *Wah Shan*, and on the other bulk carrier visited during the investigation, how a messenger line should be led onto a winch. Compared with these examples, the configuration for heaving up a tug's towline onto the aft deck of *Wah Shan* was poor. The relative ease and speed with which the operation of securing a tug can be achieved on better laid out mooring decks, illustrates the importance of good design.

The rope guards at each end of the mooring line drums on the starboard winch of *Wah Shan*'s aft deck obscured the winch operator's view of any activities at the warping drum end of the winch. Relocating the winch control to a position that would afford the winch operator with a good view of the operation/activity and of the personnel involved would improve his/her ability to react effectively to an unsafe situation developing.

In isolation, none of these improvements to the design would have prevented this accident on their own, because poorly considered working methods breached all the major safety barriers. However, well-designed, ergonomically[12] efficient equipment has a major role in preventing accidents by naturally encouraging people to work safely and discouraging bad practices. Conversely, poorly designed equipment increases the likelihood of people taking short-cuts and making errors.

It is concerning that there are probably other ships built to the same design as *Wah Shan*. Shipyards, owners and managers should therefore make every effort to identify and rectify areas where poor equipment design might inadvertently encourage unsafe working practices to develop.

VDR

No VDR data had been recorded for the period around the time of the accident. The reason for this could not be adequately explained by

[12] The International Ergonomics Association defines ergonomics or human factors as follows:

> *Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance*.

the crew or VDR technician. One reason why data recording had stopped at 2022 UTC on 28 September might have been that the crew of *Wah Shan* had switched off the main power to the VDR in preparation for replacing the battery at Immingham. It was established by the VDR service engineer during the APT that, with no mains power, the battery power would have been switched off after 2 hours of recording. It is considered extremely unlikely that the service engineer left the vessel with the VDR being powered only by the reserve battery because he left the vessel at 1500 UTC on 28 September. At the very latest, the data recording would have stopped at 1700 UTC, not at the recorded time of 2022 UTC. It is therefore more likely that the ship's crew switched off the main power after the service engineer left the vessel, either deliberately (in preparation for changing the battery) or inadvertently.

The DVD RAM write mechanism was not functional at the time of the accident and it could not be established that it had ever worked. The APT should have identified this deficiency because the DVD RAM write mechanism was the only means of archiving data when the 'data save' function was activated after an accident. Even if the DVD RAM write mechanism had been working, it could not have archived the data because there was no disc in the drive. It is concerning that the service engineer issued an APT certificate without being able to confirm the user-initiated 'data save' function was serviceable. It is even more concerning that the vessel's VDR continued to pass several audits, surveys and inspections from 2003 onwards without a functional archiving mechanism.

The VDR is a mandatory piece of equipment, and it is the responsibility of the vessel's owner and crew to ensure that it is fully functional at all times. Importantly for this investigation, the absence of VDR data meant that it was not possible to form a detailed picture of the interaction between the pilots, the ship's crew and tug crew prior to and immediately after the accident.

Emergency response

The injury suffered by Mr Wang Ji-Yue was extremely severe and it was very unlikely that either the crew or pilots could have saved his life; they were neither qualified nor equipped to deal with the medical trauma which confronted them. However, in the circumstances, they made Mr Wang Ji-Yue as comfortable as possible while awaiting professional medical assistance.

The decision to carry on with berthing rather than waiting for the helicopter to arrive was considered appropriate given the circumstances.

CONCLUSIONS

- It was considered most likely that the carpenter, Mr Wang Ji-Yue, was fatally injured when a section of the tensioned messenger line slipped off the end of the warping drum and struck him on the neck.
- The aft mooring team did not use the equipment that was available to them effectively, or follow safe line-handling practices.
- The second officer, who was in charge of the operation on the aft mooring deck, demonstrated very poor leadership. He had not understood or assessed the risks involved effectively and, despite several indications that the task was not progressing well, he did nothing to prevent the errors from compounding.
- The aft mooring team of *Wah Shan* did not work effectively as a team, resulting in the carpenter taking several unilateral decisions on the morning of the accident.
- The instructions set out in *Wah Shan*'s SMS, for the risks involved in potentially hazardous work activities to be assessed, were not followed effectively.
- The arrangement of the equipment on the aft mooring deck of *Wah Shan* did not provide an obvious safe method of using a winch to heave in a tug's tow wire. In addition, the rope guards at each end of the mooring line drums obscured the winch operator's view of any activities at the warping drum end of the winch.
- The power to the VDR was lost shortly after the VDR service engineer left the vessel at Ijmuiden. The absence of the VDR data meant that it was not possible to form a detailed picture of the interaction between the pilots, the ship's crew and the tug crew prior to and immediately after the accident.

ACTION TAKEN

MAIB actions

The MAIB has written to the ship builder, CSBC Corporation, Taiwan, highlighting the importance of considering safe working methods when designing equipment layouts.

The MAIB has also asked the International Chamber of Shipping to disseminate a short safety flyer based on this report to its members in order to raise awareness of the safety issues identified from this accident.

Actions taken by other organisations

The **Sincere Navigation Corporation** has taken the following actions:

- Carried out an accident investigation on board *Wah Shan*
- Issued a fleet circular entitled '*Precautions in mooring and tug operations*' which includes:
  - Reiteration of the SMS requirement to use the 'Operational Risk Check List' to assess, control and mitigate the risk of towing and mooring operations.
  - A requirement to display the correct mooring and towing arrangements both on the bridge and at mooring stations.
  - An instruction to officers in charge of mooring teams to dynamically assess the risk of the planned task, including the layout and lead of lines.
  - An instruction to senior officers to carry out familiarisation for new crew members and to demonstrate correct practices when there is a change of crew member in charge of mooring operations.
- Provided crew manning companies with a mooring and tug operations summary with illustrations in order to aid in the safety training of joining crew members.
- Provided all vessels in the fleet with computer-based training packages on safe mooring and towing operations, to be included as part of shipboard training programmes.

The **Maritime and Coastguard Agency** produced a report about the accident which was copied to the MAIB and the Panamanian administration.

RECOMMENDATIONS

The **Sincere Navigation Corporation** is recommended to:

2013/220 Improve the effectiveness of the safety management systems on board its managed vessels by:

- Ensuring crew have the necessary technical competence to complete hazardous tasks
- Improving leadership and team-working skills among their crews
- Encouraging crew members to develop the habit of carrying out effective risk assessments before carrying out any hazardous tasks.

Safety recommendations shall in no case create a presumption of blame or liability

SHIP PARTICULARS

Vessel's name	*Wah Shan*
Flag	Panama
Classification society	American Bureau of Shipping
IMO number/fishing numbers	9268825
Type	Bulk carrier
Registered owner	Newton Navigation Limited, Marshall Islands
Manager(s)	Sincere Navigation Corporation, Republic of China (Taiwan)
Construction	Steel
Build	2003, China Shipbuilding Corporation, Kaohsiung (Taiwan)
Length overall	289m
Gross tonnage	91165
Minimum safe manning	14
Authorised cargo	Dry bulk

VOYAGE PARTICULARS

Port of departure	Ijmuiden, The Netherlands
Port of arrival	Immingham, UK
Type of voyage	Short international
Cargo information	Coal
Manning	23

MARINE CASUALTY INFORMATION

Date and time	2 October 2012, 0712
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	53º 31' 00N, 000º 10' 00E
Place on board	Aft mooring deck
Injuries/fatalities	1 fatality
Damage/environmental impact	None
Ship operation	Arrival
Voyage segment	River passage
External & internal environment	17 knots, SW wind, daylight, calm sea, dry, good visibility
Persons on board	23

DFDS RESPONSE TO ExQ2

APPENDIX 3

DIAGRAMS

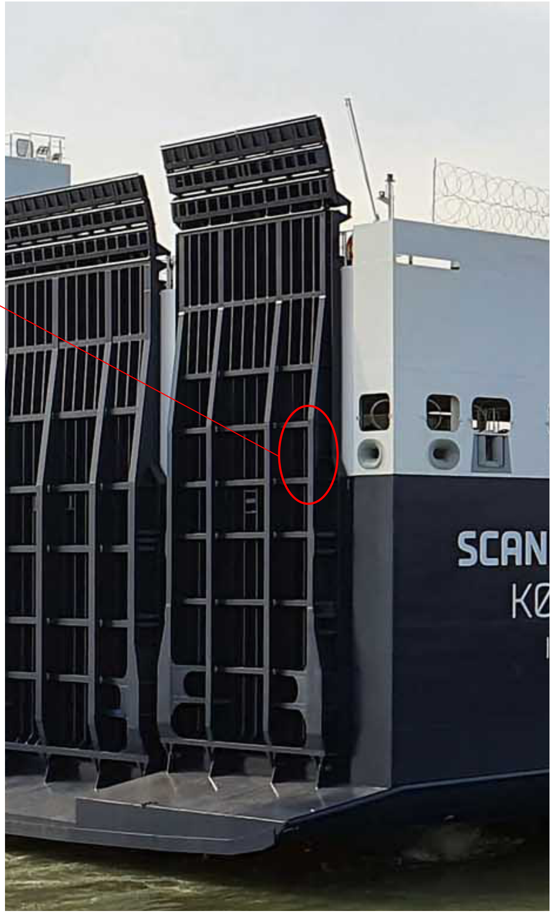
Stern Ramp Issue

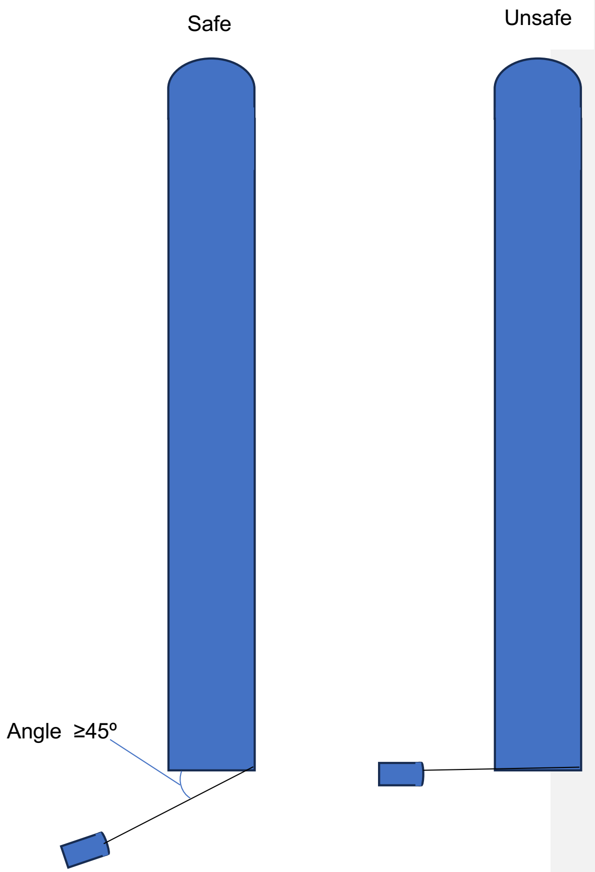
This is the location at which the aft tug can make fast (secured).

One such 'lead' is available on each side of the vessel.

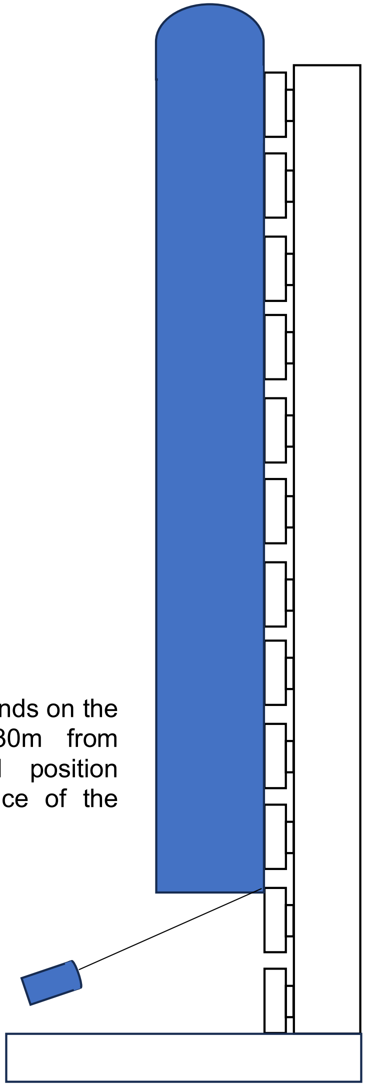
Danger to tugs line

The sharp edges of the ramp mean that tugs need to operate at 45º to the vessel at all times

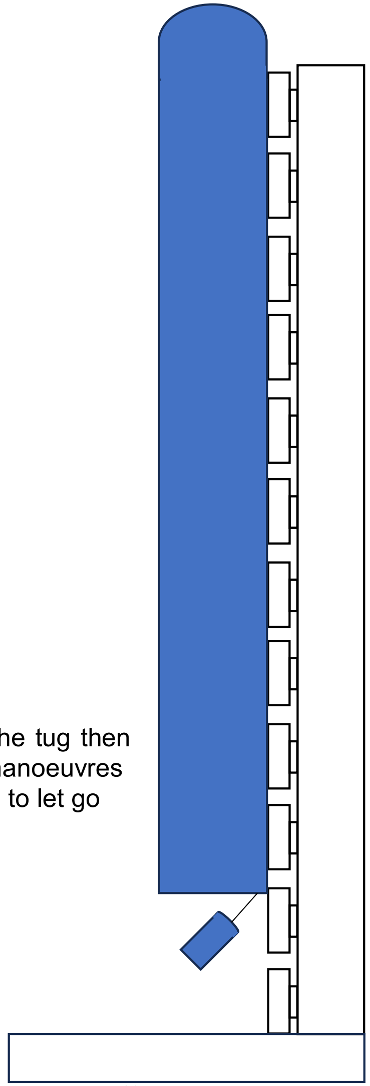




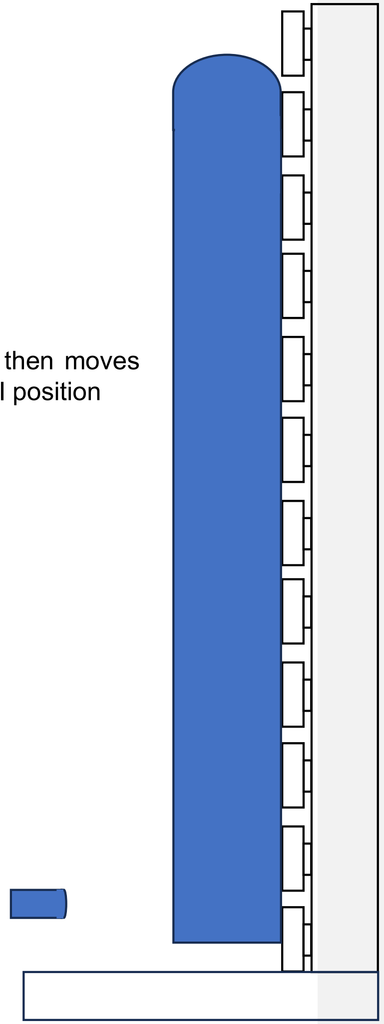
Arrival



The vessel lands on the fenders 20-30m from the required position with assistance of the tug

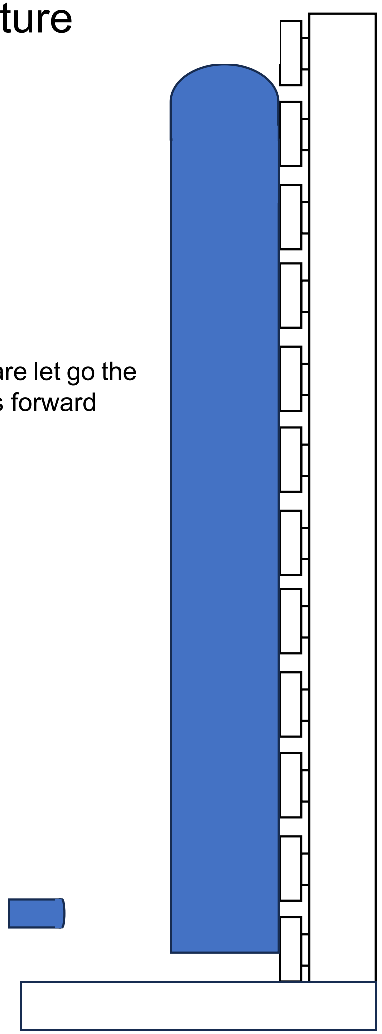


The tug then manoeuvres in to let go

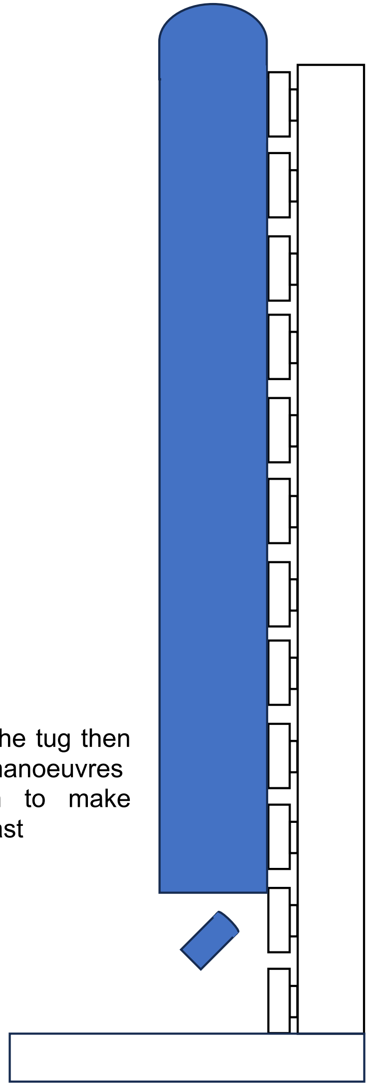


The vessel then moves into the final position

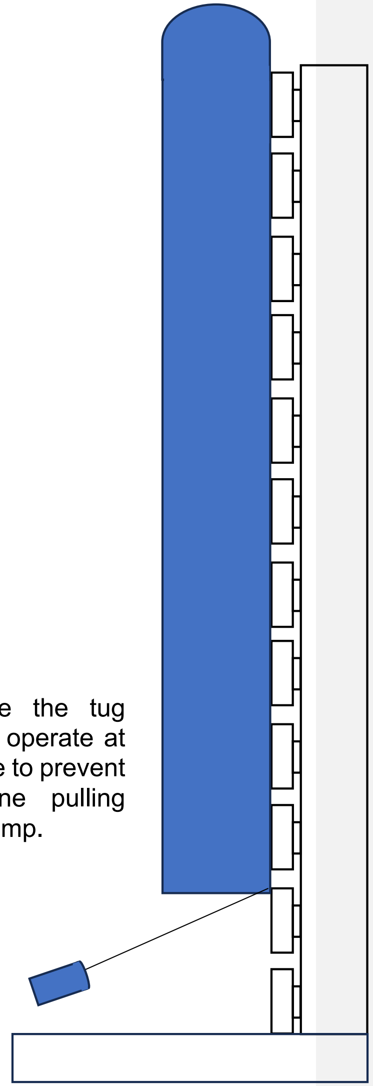
Departure



Once lines are let go the vessel shifts forward



The tug then manoeuvres in to make fast



Once secure the tug must always operate at this 45º angle to prevent the tugs line pulling across the ramp.

DFDS RESPONSE TO ExQ2

APPENDIX 4

MAIB REPORT - XUCHANGHAI

Report on the investigation of

the collision between

XUCHANGHAI

and

ABERDEEN

Immingham Oil Terminal

12 December 2000

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

Report No 30/2001
August 2001

Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999

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

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

ABP	Associated British Ports
ABS	American Bureau of Shipping
CCS	China Classification Society
CPP	Controllable Pitch Propeller
DSA	Dead Slow Ahead
GPS	Global Positioning System
HA	Half Ahead
HIT	Humber International Terminal
ICS	International Chamber of Shipping
IOT	Immingham Oil Terminal
kW	Kilowatt
m	Metre
OPPRC	Oil Pollution Preparedness, Response and Co-operation
RPM	Revolutions Per Minute
SA	Slow Ahead
STCW 95	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995
UTC	Universal Co-ordinated Time
VHF	Very High Frequency
VTS	Vessel Traffic Services

SYNOPSIS

On the evening of 12 December 2000, MRSC Humber informed the MAIB that the bulk carrier *Xuchanghai* had collided with the shuttle oil tanker *Aberdeen*, which was berthed at the western end of the Immingham Oil Terminal (IOT). An investigation began the following day.

Xuchanghai was inbound for the Immingham Dock laden with 27,672 tonnes of Ilmenite. She had a pilot embarked and had secured a tug on her bow before she reached the oil terminal. A second tug was positioned at the stern, but her tow wire was not connected until immediately prior to the collision.

In anticipation of having to turn off the entrance to Immingham Dock, the pilot reduced the vessel's speed as she approached the eastern end of the oil terminal. Making only 3 knots through the water, with a 20-knot wind on her port quarter, and in a strong flood stream, *Xuchanghai* lost steerage and turned towards *Aberdeen*. The pilot took corrective action using helm, engine and the bow tug, but failed to prevent *Xuchanghai* colliding with *Aberdeen*.

The investigation highlighted the following key factors:

1. The vessel's speed was insufficient to maintain steerage in the prevailing conditions.

2. *Xuchanghai* was scheduled off Immingham one hour earlier than was considered the optimum time.

3. The stern tug was unable to assist until immediately prior to the collision.

Recommendations addressed to Associated British Ports aim at improving the safety arrangements and procedures for vessels proceeding to Immingham Dock, and other vessels in the vicinity of the Immingham Oil Terminal. Others, to *Xuchanghai* 's owner, are aimed at ensuring pilots are provided with appropriate information when boarding its vessels, and that masters and navigational watchkeeping officers have an adequate knowledge of the English language for safe pilotage operations.

SECTION 1 - FACTUAL INFORMATION

(Times are UTC) (All courses are true)

1.1 PARTICULARS OF *XUCHANGHAI* AND *ABERDEEN* AND ACCIDENT

Vessel details		*Xuchanghai*
Registered owner	:	Cosco Bulk Carrier Co
Port of registry	:	Panama
Flag	:	Panama
Type	:	Bulk Carrier
Built	:	Shanghai, 1997
Classification society	:	CCS
Construction	:	Steel
Length overall	:	175m
Draught	:	9.55m
Gross tonnage	:	18,074
Engine power and type	:	5848kW oil engines, direct drive
Service speed	:	14 knots
Other relevant info	:	Single right-handed screw, fixed pitch
Accident details		
Time and date	:	1620 UTC on 12 December 2000
Location of incident	:	Immingham Oil Terminal No 1 berth
Persons on board	:	25
Injuries/fatalities	:	None
Damage	:	Indentation to bulwark and stiffening on port bow. Buckling to ladder and vent in the same area.

Vessel details		*Aberdeen*
Registered owner	:	Getty Maritime
Manager(s)	:	Northern Marine Management
Port of registry	:	Nassau
Flag	:	Bahamas
Type	:	Shuttle Tanker
Built	:	1996, Bilbao, Spain
Classification society	:	ABS
Construction	:	Steel
Length overall	:	221.84m
Draught	:	15.2m
Gross tonnage	:	47,274
Engine power and/or type	:	14314kW oil engines
Service speed	:	14.5 knots
Other relevant info	:	Two bow thrusters forward, one thruster aft Single screw, CPP

Accident details		
Time and date	:	1620 UTC on 12 December 2000
Location of incident	:	Immingham Oil Terminal No 1 berth
Persons on board	:	28
Injuries/fatalities	:	None
Damage	:	20m gash in No 2 starboard ballast tank

1.2 BACKGROUND

Xuchanghai, a bulk carrier, was carrying 27,672 tonnes of Ilmenite from Bunbury, Australia, to Immingham, UK. She anchored off the entrance to the River Humber at 0200 on 11 December 2000 and weighed anchor at 1330 the following afternoon to embark a pilot to proceed into port. She was scheduled to embark the pilot at 1430 and to arrive off Immingham Dock at 1630. Two tugs, *Lady Cecilia* and *Lady Alma,* were allocated to attend her entry into Immingham. This was the first time *Xuchanghai* had visited the port.

Aberdeen, a North Sea shuttle oil tanker, had completed discharging her cargo at IOT No 1 berth, and was due to sail at 1700 on 12 December 2000.

1.3 NARRATIVE

At 1435 the pilot boarded *Xuchanghai* off Spurn light vessel in the approaches to the River Humber. He proceeded to the bridge and, after introducing himself to the master, ordered the telegraph to Full Ahead and altered course to starboard to make for the northern side of the channel. He then spoke to Immingham Dock via VHF radio channel 19 and confirmed the vessel's intended arrival time off the dock entrance as 1630. The pilot knew that one of the tugs available to him for the entry to Immingham was *Lady Alma* but was unsure of the second. At about 1450, he called *Lady Alma* by VHF radio and, after being advised that *Lady Cecilia* would be the other tug, informed both tugs of his intention to meet them to the south-east of the IOT. Average speed during the passage to Sunk Spit buoy was about 10 knots over the ground.

At about 1535, Immingham Dock advised the pilot via VHF radio that *Xuchanghai* 's berth in Immingham had been changed, but her scheduled time off the dock remained the same. Accordingly, the mooring teams went to stations fore and aft at 1545. The second officer was in charge of the mooring team aft and left the bridge. The teams had been briefed on the securing of the tugs and the berthing plan, and were able to communicate with the master via hand-held VHF radios.

At 1555 *Xuchanghai* left the western end of the Sunk Dredged Channel at Dead Slow Ahead. Shortly after, the pilot stopped the engine to reduce speed in anticipation of meeting and securing the tugs. The vessel continued to steer without difficulty as she proceeded to the south of the Killingholme leading lights transit with the pilot passing direct helm orders to the helmsman, not courses to steer. In the vicinity of No 10 Upper Burcombe buoy, however, when the vessel had slowed to about 7.5 knots over the ground, the pilot had to put the telegraph briefly to Slow, then Half Ahead to maintain steerage.

Lady Cecilia met *Xuchanghai* in the vicinity of No 10 Upper Burcombe buoy and positioned herself on her bow before passing a messenger and tow wire. *Lady Alma* took up a position astern shortly after and passed her messenger line.

Lady Cecilia was made fast at about 1616 as the vessel approached IOT No 3. At this point, *Xuchanghai* was to the south of the Killingholme leading lights, heading 288° with her engine stopped; speed over the ground by GPS was about 7 knots. The pilot intended to remain at the minimum speed required to maintain steerage in preparation for a planned 180° turn once clear of the IOT, so as to head into the tidal stream and wind before entering Immingham lock.

At 1617, as she passed IOT No 3, the vessel started to swing gradually to port. The pilot ordered the helm hard to starboard. The rudder indicator confirmed the helm was to starboard, but the vessel did not respond. Half Ahead was then ordered by the pilot, who also directed *Lady Cecilia* to take some weight on the starboard bow. The telegraph was ordered to Stop after about 30 seconds. *Lady Alma* then informed the pilot that her tow wire was still being passed and was not yet made fast. As *Xuchanghai* 's head continued to swing to port, the pilot again put the telegraph to Half Ahead and also directed *Lady Cecilia* to take more weight on the starboard bow.

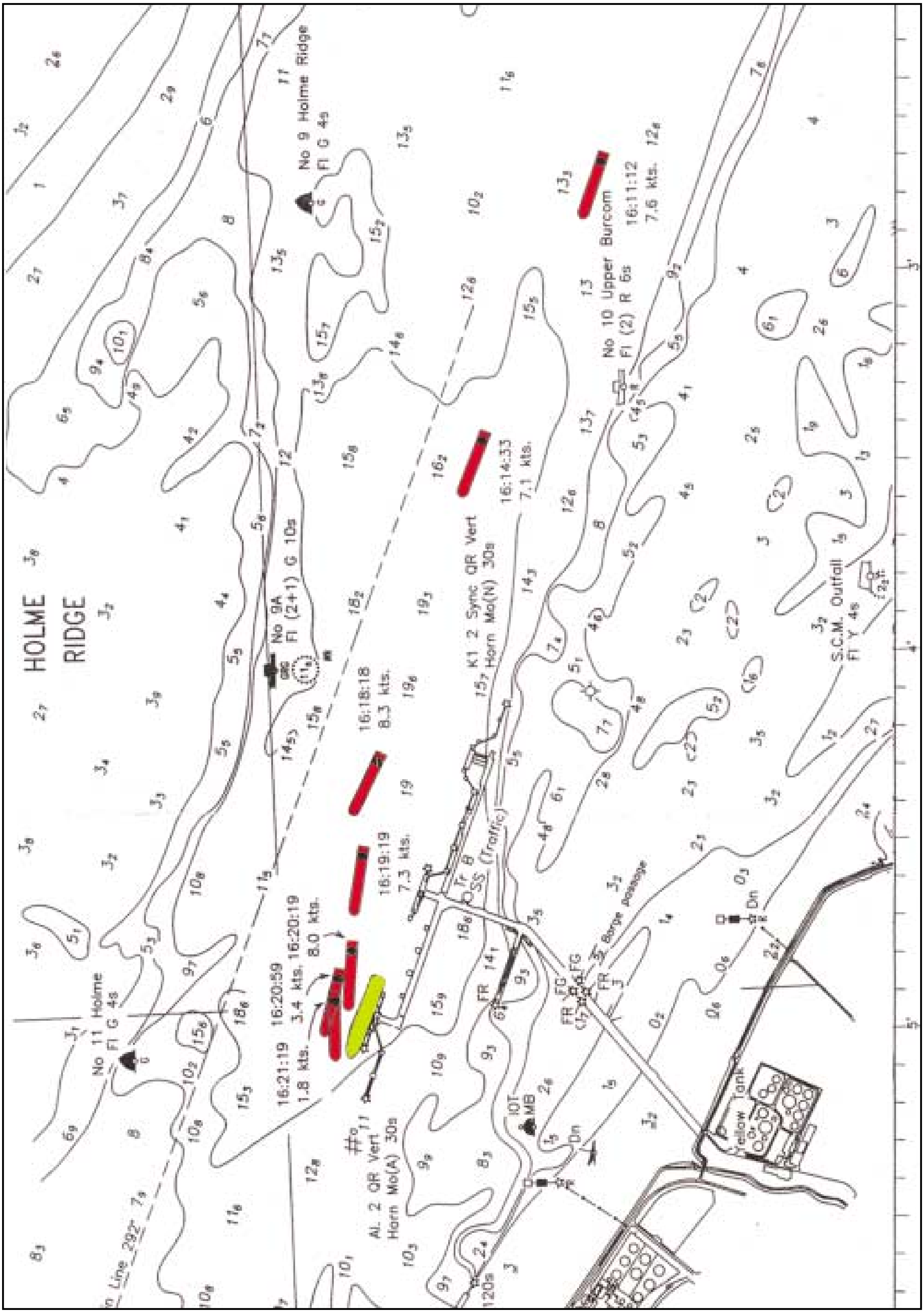
As *Xuchanghai* passed IOT No 2, the pilot moved to the port bridge wing. The vessel was now within 150m of the IOT and pointing towards *Aberdeen,* which was alongside IOT No 1, bows west. She was converging towards *Aberdeen* at an angle of about 40°. Concerned that he was closing *Aberdeen*, and that his actions were not adequately correcting the swing to port, the pilot ordered Half Astern. Thirty seconds later he ordered Full Astern and directed *Lady Cecilia* to 'give it all you have got'. *Lady Cecilia*'s skipper manoeuvred at right angles to *Xuchanghai*, and removed the engine limiters to give the maximum pull possible. The pilot then asked *Lady Alma* if she was secured, but her master was unable to confirm this. *Xuchanghai* 's master was also trying to confirm with his mooring team the status of the after tug. Under the influence of the forward tug, *Xuchanghai* 's bow eventually started to swing to starboard but, at 1620, she collided with *Aberdeen* at an angle of between 15° and 20°. **Figure 1** shows the track of *Xuchanghai* from No 10 Upper Burcombe buoy to IOT No 3 as recorded by Humber VTS. At no time leading up to the collision did the master offer advice to the pilot or intervene.

As a result of the collision, *Aberdeen*'s No 2 segregated ballast tank was ruptured, and one of her forward shore mooring lines parted. *Lady Cecilia*'s tow wire also parted immediately after impact. Using VHF radio, *Lady Cecilia*'s master immediately informed Immingham Dock of the collision.

After the collision, the tidal stream carried *Xuchanghai* clear of the IOT. *Lady Kathleen*, the fire standby tug, was tasked to attend *Aberdeen* and to assist if required. Using *Lady Alma*, which was now secured astern, along with *Lady Cecilia* pushing on the bow, the pilot was able to turn the vessel into the tidal stream. She eventually entered Immingham lock at 1730.

As only clean ballast water leaked from the ruptured ballast tank, there was no pollution and the Humber Oil Pollution Preparedness, Response and Co-operation (OPPRC) plan was not instigated.

Figure 1



Track of *Xuchanghai* as recorded by Humber VTS

1.4 THE PILOT

The pilot held a Class 1 Certificate of Competency and joined Humber Pilots in 1992. He completed his training four years later and qualified as a first class pilot in April 2000. The usual Humber Pilots' work schedule was 12 days on, followed by 8 days off. While on duty, pilots were placed on a roster, or 'turn list', and were allowed to remain on-call at home until called. The pilot, who was 5 days into his period of duty, had returned home after completing his last job at about 2200 on 11 December. He then spent the night in bed and was well rested. At 1148 on 12 December, Associated British Ports (ABP) informed him by telephone that he was required to take *Xuchanghai* from Spurn to Immingham that afternoon. He was given no information, other than the vessel's name, draught, destination, and timings. Before travelling by car to the Spurn pilot station, the pilot obtained the vessel's tonnage from the pilot order list at the pilot office in Albert Dock. He was aware of the tidal predictions for the day, and that the height of tide was likely to exceed prediction.

1.5 THE CREW

Xuchanghai 's crew were Chinese, and only her second officer could converse comfortably in English. During the 3 months that her master had been on board, she had visited 10 different ports, using a pilot each time to berth and unberth.

1.6 THE PILOT AND MASTER INTERCHANGE

Shortly after embarking, the pilot explained to *Xuchanghai* 's master the berthing procedure and securing arrangements for the tugs, including the use of heaving lines to secure a messenger attached to the tug's tow wire. This was done via the second officer, who acted as interpreter. The pilot also used sketches to illustrate his intentions. In return, the master gave the pilot the ship's particulars, which are shown at **Figure 2.** These were not comprehensive, and not in the format suggested in the ICS Bridge Procedures Guide. The ship's manoeuvring data was displayed on the wheelhouse poster attached to the bulkhead. The pilot did not request, and the master did not offer, any further information. The pilot was aware the vessel had a right-handed fixed propeller, but was uncertain of the source of this information.

Figure 2

REGISTER OWNER: XUCHANGHAI SHIPPING INC.
ADDRESS: COSCO(H.K) SHIPPING CO,LIMITED
13TH FLOOR, HONG KONG SHIPPING CENTRE
167 CONNAUGHT ROAD, WEST,
HONG KONG.

MANAGERS: COSCO BULK CARRIER CO, LTD

M.V. "XUCHANGHAI"
PANAMA
OFF.NR. 25712-PEXT
G. T. 10,070.00
N. T. 9,481.00

IMO No. 9158379.

SHIP'S PARTICULARS

Ship's name:	XU CHANG HAI	Type:	Bulk/Timber
Call sign :	3 F V C 6/PANAMA	Official number:	~~25712-PEXT~~ 23568-97
Where Built:	Hu Dong Shipyard, Shanghai		
Date of Built:	25th. July. 1996		
Delivery to owner:	30th. Jan. 1997		
Gross tonnage:	18074.0	Panama canal:	$61121.70M^3$/15110.71
Net Tonnage :	9485.0	Suez Canal:	18780.07/16319.82
Length overall:	175.0M		
Breadth :	26.0M		
Depth :	13.90M		
L.B.P :	165.72M		
Light Vessel :	7651.715M		
Light Vsl Draft:	0.421/4.349M	Mean:	2.385M
Summer draft :	9.816M		
Maxmum Height :	43.05M		

Draft for Bulk Cargo:

	Draft	Freeboard	Displacement	Deadweight
Summer	9.816	4.124	34762.61	27110.61
Tropical	10.020	3.920	35561.39	27909.39
Tropical fresh	10.243	3.697	~~35551.30~~	27899.30
Fresh	10.039	3.901	34766.60	27114.6
Winter	9.612	4.328	33969.73	26317.73

Draft for Timber Cargo:

	Draft	Freeboard	Displacement	Deadweight
Summer	10.139	3.801	36030.60	28378.60
Tropical	10.350	3.590	36862.54	29210.54
Tropical Fresh	10.579	3.361	36847.30	29195.30
Fresh	10.368	3.572	36032.10	28380.10
Winter	9.858	4.082	34926.94	27274.94

Cargo in hold: Total: $36847.7M^3$/Grain, $35742.27M^3$/Bale
Full oil tanks: Total: $1361.86M^3$/100% $1334.46M^3$/98%
Diesel oil tanks: Total: $134.44M^3$/100% $131.751M^3$/98%
Fresh water tanks: Total: $411.72M^3$/100%
Ballast water tanks: Total: $87339M^3$ Hold No.3/$7844.07M^3$
Total: $16577.97M^3$

Machine: B & W
Horse Power: 5846KW
INMARSAT C ID:435422810 XCHA X
B ID:335422810 TEL1 335422812 FAX

Particulars of *Xuchanghai*

1.7 THE TUGS

1.7.1 General

Lady Cecilia, *Lady Alma*, and *Lady Kathleen* were operated by Howard Smith Towage. *Lady Cecilia*'s master had worked on tugs for 25 years, and had been in command for eleven. *Lady Alma*'s master had worked for Howard Smith Towage for 40 years, and had been in command since 1969. Both masters were aware for vessels requiring tugs proceeding to Immingham, that it was usual practice for the tugs to secure to the south-east of the IOT.

Lady Cecilia had a certified bollard pull of 53 tonnes, and *Lady Alma* had a certified bollard pull of 59 tonnes; both had Voith-Schneider propulsion units.

Examination of *Lady Cecilia*'s tow wire, which parted on impact, revealed that it had been in good condition.

1.7.2 Securing of *Lady Alma*

Lady Alma manoeuvred astern of *Xuchanghai* between No 10 Upper Burcombe buoy, and IOT No 3, and passed her tow wire at about 1617. The officer in charge of the aft mooring team attempted to indicate the tow wire was made fast by giving the 'OK' signal using his thumb and fore-finger. This signal was not seen by *Lady Alma*'s master, nor by any other members of his crew, and he could only confirm his tug was fast after applying weight on the tow wire immediately before the collision.

1.7.3 Actions of *Lady Cecilia*

From on board Aberdeen, the tug was perceived to be on *Xuchanghai* 's port bow, with little or no weight on her tow wire until moving across to the starboard bow shortly before the collision. However, the weight of evidence indicates that after making fast, *Lady Cecilia* remained directly ahead of *Xuchanghai* on a tight wire, but without weight, until moving to the starboard bow when directed by the pilot.

1.8 ENVIRONMENTAL CONDITIONS

Spring tides were exceptionally large. High water Immingham was predicted to be at 1828 with a height of 7.4m. The predicted height of tide at 1620 was 4.8m. At 1628 the tidal stream off the IOT was predicted to be flooding at a rate of 3.2 knots; at 1728 it was predicted to be 3 knots. The actual tidal stream at the time of the collision was reported by several sources to be greater than 4 knots. The wind was south-east at about 20 knots. Evening civil twilight was at 1623, and visibility was good.

1.9 SHIPHANDLING CHARACTERISTICS

Xuchanghai had a single right-handed fixed propeller, driven by a diesel engine. She had one rudder and no bow thruster. The engine was in bridge control. In the master's experience, the vessel maintained steerage down to a speed of 2 knots, and lay bow to the wind when stopped in the water.

1.10 EXTRACT OF RECORDED ENGINE MOVEMENTS

The following is a summary of *Xuchanghai* 's engine movements immediately before the collision:

Time	Set	RPM	Achieved	Time	RPM
1617.37	DSA	+45		1617.39	+40
1617.41	SA	+55		1617.43	+60
1617.43	HA	+85		1618.15	+80
1618.21	Stop	0		1618.30	0
1618.41	HA	+85		1618.49	+70
1618.50	Stop	0		1618.52	+30
1618.55	Half Astern	-70		1619.26	-70
1619.27	Full astern	-90		1620.28	-90

Note: the actual times recorded have been corrected by adding 25 seconds.

1.11 IMMINGHAM OIL TERMINAL

The tidal flow during a flood tide at the IOT, particularly at No 1 berth, changes direction from west to west-north-west. This can set vessels away from the IOT towards the buoys, notably Holme No 1 buoy and then swing to port if unchecked.

The navigable channel for vessels of this size and draught is approximately 510m wide. The minimum charted depth in the channel off the IOT is 12.8m but the average depth is between 15m and 19m. Pilots on the flood tide generally aim to pass the IOT just south of the Killingholme leading lights, which are in line on a bearing of 292°. This provides more safe water to the north and allows for the increased set after reducing speed on passing the IOT as required by navigation bylaws in which 14(3) states:

The master of a vessel shall ensure that the vessel does not exceed a speed of 5 knots when approaching and passing any jetty when any vessel is mooring, moored or unmooring at the jetty.

The pilot interpreted this speed limit as referring to speed through the water, not speed over the ground.

The navigable channel to the north of the IOT is shown at **Figure 1.**

1.12 IMMINGHAM DOCK

The planned movements of vessels to and from Immingham Dock on 12 December 2000 were:

1500	-	*Lysvik*	-	Outbound
1530	-	*Princess Corolla*	-	Outbound
1630	-	*Xuchanghai*	-	Inbound
1700	-	*Tor Anglia*	-	Outbound
1730	-	*Lyra*	-	Outbound

Originally, *Xuchanghai* was planned to proceed to berth 9C, but this was changed because *Princess Corolla* had been unable to sail. It was decided to continue to bring *Xuchanghai* through the dock and put her on a holding berth from where she could be moved and start unloading as soon as *Princess Corolla* sailed.

Entry to Immingham Dock was via a lock. Entry was conducted on a flood tide and it was considered ideal for vessels of *Xuchanghai* 's draught and tonnage to enter Immingham Dock about an hour before high water when the tidal stream across the bell mouth of the lock was slack. Before entering the lock, vessels turned through about 180° in the main channel off the lock entrance, to stem the tidal stream during their approach.

The decision to bring *Xuchanghai* off the bell mouth an hour earlier than the optimum time was intended to give greater operational flexibility given the two outbound ferry movements at 1700 and 1730, and because of restrictions regarding the use of the lock gates during large tides. The increased risk was assessed and deemed acceptable. The lock gates were not allowed to be operated if the depth of water over the outer sill exceeded 14.8m. On 12 December, as the depth of water was predicted to be 15m, a closure of the lock for a brief period was anticipated. The depth of water actually reached 15.4m and the lock was closed from 1828 to 2010.

The pilot was aware that the scheduled time off Immingham lock was about an hour earlier than the optimum time. He was concerned about the prevailing conditions for turning and entering the lock, but not for passing the IOT. However, he did not express his concerns to anyone.

1.13 THE DAMAGE

1.13.1 Aberdeen

The vessel had a double bottom and was fitted with segregated ballast tanks. She had completed discharging her cargo, and her empty cargo tanks had been crude oil washed and inert gassed. As a result of the collision, she sustained a 20m gash in her No 2 starboard ballast tank and, after sailing from the IOT, proceeded to Rotterdam for repairs. In Rotterdam the vessel was put into dry dock where it was confirmed there had been no damage below the waterline or inner hull, and a 40m long section was cropped and replaced. A photograph showing *Aberdeen* undergoing repair is at **Figure 3**.

Figure 3

Photograph of damage to *Aberdeen*

1.13.2 Xuchanghai

Xuchanghai sustained damage to her port side bulwark and stiffening over about 10m from the stem. A ladder and vent in this area were also buckled. There was no damage below the waterline. A photograph of *Xuchanghai* alongside in Immingham following the collision is at **Figure 4**.

Figure 4

Xuchanghai alongside at Immingham

1.14 ACTIONS BY ABP

1.14.1 Notice to Mariners

Following the collision, ABP issued a local notice to mariners (No H. 9/2001) on 29 January 2001 entitled **River Humber, Passing Immingham Jetties**. In addition to highlighting the speed limit contained in the navigational bylaws, the notice stated:

1. *Masters and pilots of vessels which have to pass the Immingham Oil Terminal jetties must not approach nearer than 150 metres from the face of the berths…*

   ..The Master/Pilot of a vessel shall navigate the vessel with due care and caution when passing these berths and at a speed that shall not endanger the safety of the vessel or of vessels moored on the berths of the Immingham Oil Terminal.

2. *All vessels inward who require a tug or tugs to berth at Immingham Dock, East or West jetty, Immingham Bulk Terminal, Immingham Gas Terminal or South Killingholme Oil Jetty must reduce their speed and complete making tugs fast before the vessel passes Berth No. 3 of the Immingham Oil Terminal.*

   Ferries berthing at Immingham Dock are exempt from this requirement.

   All other vessels must ensure that they maintain good steerageway having regard to the prevailing tidal and meteorological conditions.

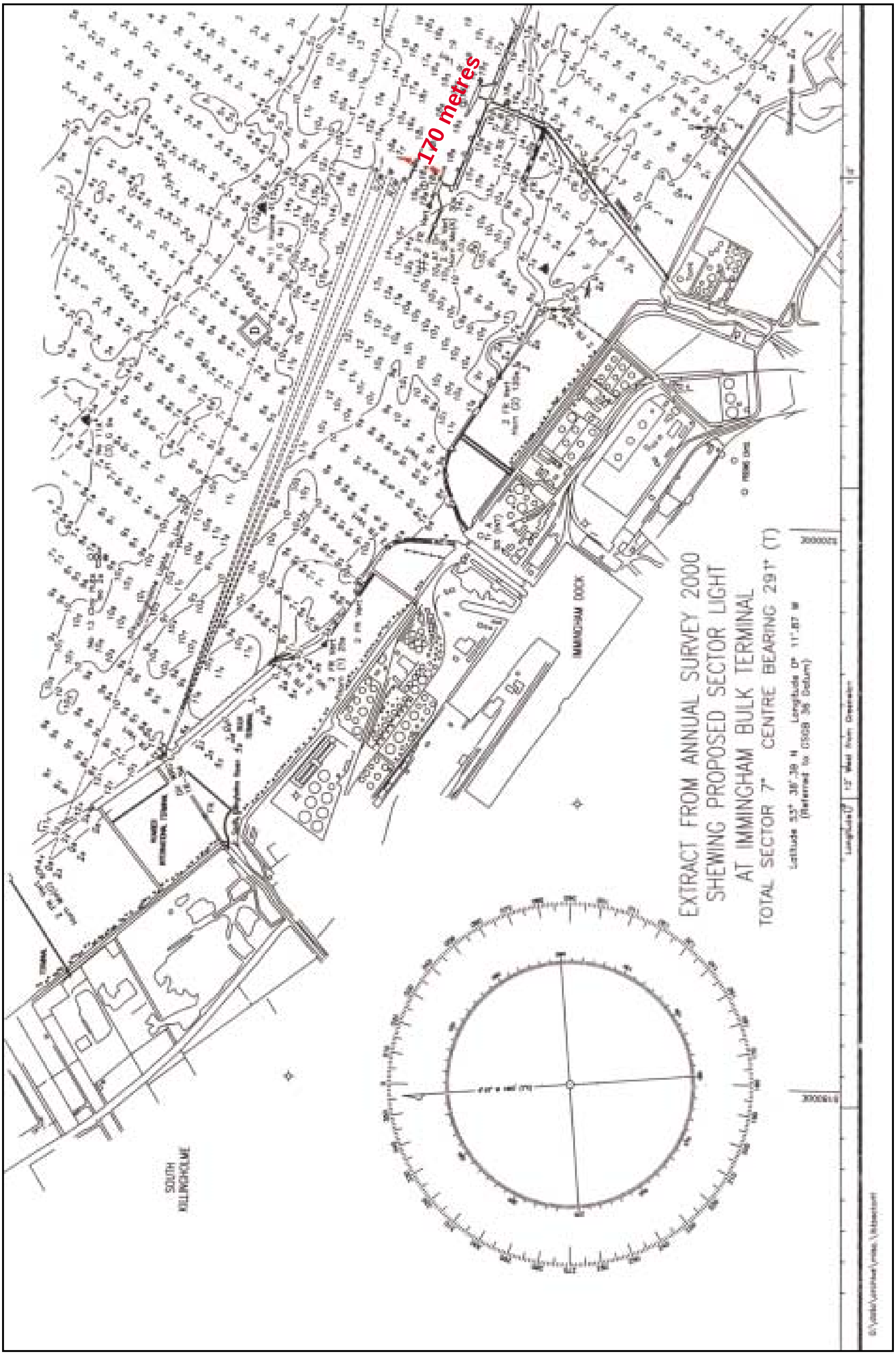
1.14.2 New light on the Humber International Terminal

To aid vessels on the approach to the Humber International Terminal (HIT), ABP has installed a sector light on the terminal, in position 53°38'39N 000° 11'87W (OSGB 36 datum). The position of the light and its sectors is shown at **Figure 5**. The central white sector is displaced about 170m from the face of IOT No 1.

1.14.3 Scheduling review

Parameters for establishing the time of entry/exit from the locks of tidally restricted vessels are being reviewed and discussed with pilots, tug operators and the harbour master's department as part of the Port Marine Safety Code currently under preparation and in light of this incident.

Figure 5



Details of the New Sector Light

SECTION 2 - ANALYSIS

2.1 MASTER AND PILOT RELATIONSHIP

The pilot's knowledge of the vessel was limited. He had never been on board the vessel before, and therefore relied on the master to supply him with the necessary information regarding her handling characteristics. Rather than obtaining relevant information from a pilot card in the format suggested in the ICS Bridge Procedures Guide, the pilot had to use a copy of the ship's particulars shown at **Figure 2**, together with the wheelhouse poster containing the vessel's manoeuvring data. These documents provided basic information which was not expanded upon by the master. A more comprehensive exchange of information might have been possible had there been no language difficulties, had the pilot been more probing and the master more forthcoming. A pilot card in the recommended format would have been of greater use to the pilot.

Language difficulties and cultural differences, along with his lack of practical shiphandling experience in the vessel might have also influenced the master's decision not to intervene when it became apparent the vessel was standing into danger. Having never berthed or unberthed the vessel without a pilot and, unable to converse in English to pass on his intentions to the pilot or control the tugs, he was not well placed to offer advice or take over from the pilot. Also, his intervention when the engine was at Full Astern, the helm hard to starboard, and the forward tug applying maximum pull, could possibly have caused confusion which might have resulted in a worse outcome.

2.2 SPEED LIMIT IN THE HUMBER

The speed limit of 5 knots laid down in the navigation bylaw 14(3), and repeated in local notice to mariners H.9/2001, is ambiguous. It is not clear whether this refers to speed over the ground as measured by GPS, or speed through the water as measured by log. In the Humber, where the tidal stream can be strong, the difference between the two may be considerable.

For example, with a flooding tidal stream at a rate of 4 knots off the IOT, a vessel proceeding at 5 knots by log would be make good 9 knots over the ground when heading in the same direction as the tidal stream. At this speed, the consequences of a vessel colliding with a stationary tanker alongside could be catastrophic. When heading against the stream she would make only 1 knot over the ground. This would make for a long passage. Conversely, a vessel proceeding at 5 knots by GPS would have to adjust her engines to make good 1 knot through the water when heading with the stream, but could increase to as much as 9 knots through the water when heading into the tidal stream. When headway is as little as 1 knot through the water, steerage is likely to be lost and the vessel will be unable to maintain her course. Interpretation of the present speed limit can, therefore, result in vessels proceeding at speeds possibly not intended by the restriction.

Any speed limit is only effective if it is enforced, and appropriate action taken against offenders.

2.3 SPEED AND STEERAGE AFTER LEAVING THE SUNK CHANNEL

Having put the engine telegraph to Stop after leaving the Sunk Channel, *Xuchanghai* started to lose steerage in the vicinity of No 10 Upper Burcombe buoy, when speed had reduced to about 7.5 knots over the ground. To regain steerage, the pilot had to put the engine ahead for a brief period to increase the vessel's speed. As *Xuchanghai* passed IOT No 3, her bow started to swing slowly to port and, although maximum starboard helm was applied and the engine was once again put ahead, this corrective action was unsuccessful. The vessel's speed through the water had reduced to the extent that she had lost steerage, and the speed required to regain steerage was not possible within the sea room available. The pilot's use of maximum astern power, helm and the forward tug pulling *Xuchanghai* 's bow away from *Aberdeen* at full power, reduced the angle of impact, but was taken too late to prevent the collision.

The effectiveness of the helm is largely a function of the speed of a vessel through the water. The slower a vessel moves through the water, the more the water flow over the rudder is reduced, and the more difficult it becomes to steer. Notwithstanding a vessel's speed, several other factors also affect the ability to steer and, while it is possible that the master might have had experience of steering *Xuchanghai* at speeds as low as 2 knots, it is unlikely to have been in similar conditions to those on 12 December.

Vessels with a large proportion of their superstructure at the after end, such as *Xuchanghai*, tend to act like a weather cock when stopped in windy conditions; wind acts upon the "sail" area aft and causes the bow to swing into wind. When making headway, the effect of the wind remains, but can usually be checked by using helm. On this occasion, with the wind on *Xuchanghai* 's port quarter at a speed of about 20 knots, the vessel's bow was likely to tend to swing to port and seek wind. The reported change of direction of the tidal stream, and its effect on vessels off the IOT, might also have caused the vessel's bow to move towards the IOT. By reducing to a speed of about 3 knots through the water, the flow of water over the rudder was insufficient to counter the influences of the wind and tidal stream.

The pilot had initially reduced speed to secure the tugs. On passing the IOT however, he continued to try to keep speed to a minimum. This was not due to the speed limit; his interpretation of 5 knots through the water would have allowed him to proceed at 9 knots over the ground, 2 knots faster than the speed displayed by GPS. The pilot was not concerned about the passage of *Xuchanghai* through the channel off the IOT but, conscious of the earlier than ideal scheduled time off Immingham and the rate of the tidal stream, his mind might have been overly focussed on the turn required before entering the lock. The slower the speed of the ship, the easier this manoeuvre would be to achieve. It is likely, therefore, that speed was inadvertently reduced below that required to maintain steerage in the prevailing conditions, because of the pilot's considerations for the next phase of the vessel's entry plan. It is also possible that the speed indicated by GPS, along with the apparent speed of the vessel passing stationary features, might have caused the pilot to perceive she was moving sufficiently fast to maintain steerage.

2.4 CHANNEL OFF THE IOT

The practice of transiting the channel off the IOT to the south of the Killingholme leading lights line when proceeding to Immingham Dock on a flood tide was prudent, considering the tidal set normally experienced. However, by moving off the line of the leading lights, the pilot lost his only visual reference to indicate accurately his position in the channel and distance off the IOT. Radar was available but not used. The pilot realised he was closing the berths on the IOT, but did not know exactly how close he was.

The provision of the sector light on the HIT, albeit for other reasons, should help pilots and masters visually assess their distance off the IOT accurately, and also allow them to detect the set experienced quickly.

The imposition of the 150m exclusion zone off the IOT should also improve the overall safety in the area, and might prevent vessels closing the IOT unnecessarily when there is sufficient sea room to the north. This will allow greater reaction times if vessels passing the IOT encounter difficulties such as engine or steering failures. The fact that passing vessels have been prohibited within 150m of the IOT might also alert pilots and masters of the need to navigate with particular caution in this area. However, the zone can only be effective if it is enforced.

The prohibition of vessels from approaching nearer than 150m to the IOT, however, has reduced the width of the channel to about 360m and moved its central axis towards the IOT. These changes might require traffic volumes in this area to be carefully monitored or controlled, especially as inbound vessels to the south of the Killingholme leading lights are likely to be navigating on the wrong side of the channel.

2.5 SECURING OF TUGS

All relevant parties understood the intention to secure *Lady Cecilia* and *Lady Alma* to the south-east of the IOT. The pilot had briefed the master, the mooring teams were on stations in good time, and the tugs were in position in the vicinity of No 10 Upper Burcombe buoy. *Lady Cecilia* was secured forward quickly and without any problems. The status of *Lady Alma*'s tow wire, however, was not known to the pilot until about the time of the collision. He was, therefore, unable to use her when trying to correct the movement of *Xuchanghai* 's bow to port.

The pilot could not see the tug aft and was reliant upon either *Lady Alma*'s master, or *Xuchanghai* 's crew, to inform him when the tow was secure. The tug master was unable to confirm that the tow was secure because neither he, nor his crew, saw the visual signal from the second officer. However, it is unclear why *Xuchanghai* 's crew failed to inform the pilot that the tow was secure; a possible reason was the language difficulties between the master and the pilot. Consequently, the pilot could not use *Lady Alma* when needed. Had *Lady Alma* been secured and ready for use on passing IOT No 3, it is possible the collision could have been avoided.

The pilot and master are best-placed to co-ordinate communications between the tugs and the ship's crew on matters that cannot be confirmed unilaterally. It is therefore essential that lines of communication are adequate and that the pilot and master are able to communicate effectively.

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995 (STCW 95) requires officers in charge of a navigational watch on ships of 500gt or more, to have an adequate knowledge of the English language. However, a breakdown in communication is only one reason which may delay a tug from being made fast as planned. Problems with equipment, and the speed and ability of mooring teams, are others. The requirement in H.9/2001 for certain vessels to secure tugs before reaching IOT No 3 is considered prudent, especially where vessels need to pass the IOT at slow speed. To be effective, however, tugs need to meet vessels at a sufficient distance from the IOT to allow these potential difficulties in making fast to be identified, and for either appropriate action or abort procedures to be implemented.

2.6 ACTIONS BY *LADY CECILIA*

The action taken by the tug master immediately before the collision reduced the angle of impact, and might have prevented more serious damage. *Lady Cecilia*'s tow wire probably parted immediately following the collision because of sudden changes in tension caused by the movement of *Xuchanghai* 's bow. The tug master's prompt notification of the incident to Immingham Dock enabled the shore authorities to respond rapidly.

2.7 MOVEMENTS TO IMMINGHAM

The decision to schedule *Xuchanghai* off Immingham an hour earlier than the optimum time, for a vessel of her size, was intentional. It gave the Immingham authorities greater flexibility in achieving the programmed movements for that particular tide within a limited time-scale. The decision was made in the knowledge that it was spring tides, and that the tidal stream in the bell mouth off the lock was stronger 2 hours before high water than at 1 hour before.

The increased risk was assessed and deemed acceptable even when known that *Xuchanghai* 's intended berth was not available, and she would not be able to begin discharging until the following morning.

Advancing the time of *Xuchanghai* off the lock to 2 hours before high water, however, should not have significantly increased the risk of passing to the north of the IOT. The predicted tidal stream off the IOT at 1728 was 3 knots, compared with 3.2 knots at 1628. This was not significant and, by itself, should not have caused *Xuchanghai* to lose steerage. Steerage was probably lost because the pilot was concerned that he was turning off Immingham lock an hour earlier than the optimum time, when the tidal stream was stronger in a 20 knot south-easterly wind, and wanted to keep the vessel's speed to a minimum.

The pilot did not express his concerns to anyone.

The risk assessment criteria used for scheduling a vessel's arrival time off Immingham lock is currently under review in consultation with the pilots and other interested parties.

2.8 DAMAGE TO *ABERDEEN*

The fact that this collision did not result in a serious fire, loss of life, or significant pollution was fortunate. Had the vessel which was berthed alongside the IOT been laden, and not equipped with segregated ballast tanks, the outcome might have been considerably different. Although *Aberdeen* had discharged her cargo, the prudence of constructing tankers with segregated ballast tanks was still in evidence. Had she not been so fitted, the damage caused by *Xuchanghai* 's bow would have resulted in the release of hydrocarbons from her empty cargo tank. These hydrocarbons would have become diluted and oxygen-enriched as they mixed with the atmosphere, and could have created a significant fire risk.

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

1. The pilot was well rested. [1.4]

2. The pilot briefed the master on the berthing plan and securing arrangements for the tugs. [1.6]

3. Details of the ship were made available to the pilot, but were not in the format suggested in the ICS Bridge Procedures Guide. [1.6]

4. There was no other exchange of information between the pilot and master. [1.5]

5. *Lady Cecilia* and *Lady Alma* were the tugs allocated for the entry into Immingham lock. [1.3]

6. The vessel's mooring teams were briefed and on stations in good time. [1.3]

7. The crew of *Xuchanghai* was Chinese; only the second officer could converse comfortably in English. [1.5]

8. Initially steerage was lost in the vicinity of No 10 Upper Burcombe buoy when speed over the ground had reduced to about 7.5 knots. [1.3]

9. *Lady Cecilia* and *Lady Alma* met *Xuchanghai* in the vicinity of No 10 Upper Burcombe buoy. [1.3]

10. The forward tug, *Lady Cecilia,* made fast her tow wire by the time the vessel passed IOT No 3. [1.3]

11. On passing IOT No 3 *Xuchanghai* 's bow started to swing slowly towards the IOT. [1.3]

12. Corrective action using engine movements ahead, maximum starboard helm and the forward tug failed to check the swing. [1.3]

13. Engine movements astern, maximum starboard helm, and the forward tug pulling at maximum started to move the bow of *Xuchanghai* back to the north. [1.3]

14. The master of *Lady Alma* was unable to confirm his tow was made fast aft until immediately before the collision. [1.7.2]

15. *Aberdeen* had discharged her cargo and was preparing to sail. [1.2]

16. The corrective action was too late and *Xuchanghai* collided with *Aberdeen* at an angle of between 15° and 20°. [1.3]

17. *Lady Cecilia*'s tow wire parted immediately after impact. [1.3]

18. The master of *Lady Cecilia* used the maximum pull available. [1.3]

19. The master of *Xuchanghai* had always used a pilot to berth and un-berth. [1.5]

20. Spring tides were exceptionally large. [1.8]

21. The wind was south-east at about 20 knots. [1.8]

22. On a flood tide, the tidal stream off the IOT can cause vessels to swing towards the IOT. [1.11]

23. On a flood tide, it is usual practice for pilots to pass the IOT to the south of the Killingholme leading lights in transit. [1.11]

24. The speed limit off the IOT is 5 knots. [1.11]

25. *Xuchanghai* 's berth at Immingham was changed during the transit of the Sunk Channel. [1.3,1.12]

26. It was considered ideal for vessels of *Xuchanghai* 's draught and tonnage to enter Immingham Dock about an hour before high water. [1.12]

27. *Xuchanghai* was scheduled to arrive off the berth 2 hours before high water. [1.3,1.12]

28. *Aberdeen* sustained a 20m gash in her No 2 starboard segregated ballast tank. [1.13.1]

29. On 29 January 2001, ABP issued a local notice to mariners aimed at improving safety off the IOT. [1.14.1]

30. The installation of a sector light on the HIT should help pilots and masters visually assess their distance off the IOT. [1.14.2, 2.4]

31. The review of the risk assessment criteria used for scheduling a vessel's arrival time off Immingham lock should contribute towards improving vessel safety. [1.14.3,2.7]

3.2 CAUSES

3.2.1 Initiating Cause

The initiating cause of the collision was *Xuchanghai* 's bow swinging to port and closing *Aberdeen* as she passed the IOT. [1.3]

3.2.2 Contributory causes and underlying factors:

1. The pilot reduced the speed of *Xuchanghai* to about 3 knots through the water and steerage was lost. [2.3]

2. The pilot attempted to keep speed to a minimum off the IOT in readiness for manoeuvring off Immingham lock. [2.3]

3. The vessel's speed over the ground measured by GPS and observed relative to the IOT might have led the pilot to believe he was moving sufficiently fast to maintain steerage. [2.3]

4. The swing of the bow to port was probably induced by the wind and possibly also by the changing direction of the flooding tidal stream off the IOT. [2.3]

5. Appropriate corrective action was taken, but was too late to prevent the collision. [2.3]

6. The status of the tug aft could not be confirmed by the pilot, and was not available to assist before the collision; a possible reason was the language difficulties between the master and the pilot. [2.5]

7. *Xuchanghai* passed the IOT during a spring flood tide an hour earlier than the optimum time. [1.8, 1.12, 2.7]

8. The speed required to regain steerage could not be achieved within the sea room available. [2.3]

9. Although the master might have experienced steerage at 2 knots, it is unlikely to have been in similar circumstances. [2.3]

10. Information regarding the vessel's details and handling characteristics was limited to the manoeuvring data shown on the wheelhouse poster and the vessel's particulars provided by the master. [2.1]

11. Once south of the Killingholme leading lights, the pilot had no visual reference to accurately determine the vessel's distance off the IOT [2.4]

12. The pilot did not use radar to monitor the vessel's position in the channel off the IOT. [2.4]

13. The status of the after tug could not be confirmed until immediately before the collision. As a result the pilot was unable to use this tug or have sufficient time to implement abort procedures. [2.5]

14. The pilot did not express his concerns to anyone with respect to the scheduled arrival time off Immingham lock. [2.7]

3.2.3 Other Findings

1. The speed limit off the IOT is ambiguous. [2.2]

2. The introduction of the 150m exclusion zone off the IOT should improve overall safety in the area. [2.4]

3. The 150m exclusion zone will need to be monitored and enforced if it is to be effective. [2.4]

4. The collision could have had more serious consequences had *Aberdeen* not been fitted with segregated ballast tanks. [2.8]

SECTION 4 - RECOMMENDATIONS

Associated British Ports is recommended to consider:

1. Further highlighting the prohibited area off the IOT defined in H.9/2001 by seeking for a notation to be placed on the Admiralty charts and in sailing directions for the area.

2. Monitoring the exclusion zone off the IOT and, if deemed to improve overall safety, to incorporate it in navigational bylaws.

3. Prescribing specific locations for tugs to meet inbound vessels.

4. Implementing procedures to be followed should tugs not be connected as required by H.9/2001.

5. Amending navigational bylaws to clarify whether the 5 knot speed limit refers to speed through the water, or speed over the ground.

The owner, Cosco Bulk Carrier Company is recommended to:

6. Ensure its vessels have a pilot card available containing the information, and in the format, suggested in the ICS Bridge Procedures Guide.

7. Ensure its masters and navigational watchkeeping officers have an adequate knowledge of the English language for safe pilotage operations.

Marine Accident Investigation Branch
August 2001

DFDS RESPONSE TO ExQ2

APPENDIX 5

MAIB REPORT – FAST FILIP

GOV.UK

Contact made by general cargo vessel Fast Filip with berthed tanker

Location: Immingham Oil Terminal, England.

From:
Marine Accident Investigation Branch (/government/organisations/marine-accident-investigation-branch)

Published
23 January 2015

Vessel type: **Merchant vessel 100 gross tons or over** (/maib-reports?vessel_type%5B%5D=merchant-vessel-100-gross-tons-or-over)
Report type: **Completed preliminary assessment** (/maib-reports?report_type%5B%5D=completed-preliminary-examination)
Date of occurrence: **6 July 2008**

Completed PE Summary: Fast Filip

A short summary of the accident and action taken:

	Merchant Vessel/Accident Details
Vessel name	Fast Filip
Manager	Fast Baltic Sp z o o
Ship Owner	Fast-Herco Investments Ltd
Port of Registry	Port Vila
Flag	Vanuatu
Classification Society	Polish Register

	Merchant Vessel/Accident Details
Type	General cargo
Built	1980
Construction	Steel
Length Overall	85.81m
Gross Tonnage	1740
Date/Time	07/062008, 0003 (UTC + 1)
Location of Incident	Immingham Oil Terminal
Incident Type	Contact
Persons Onboard	6
Injuries/Fatalities	None
Damage/Pollution	Damage to plating at port quarter/None

Synopsis

Fast Filip was on passage from Goole to Immingham Dock in ballast. The master and pilot discussed the passage plan, including the departure from Goole, the river passage, and the approach to Immingham Dock. The passage would start at the end of the flood tide, and the tide would be ebbing off Immingham. The bridge was small, and the pilot took the port chair, from where he could see a radar and had control of the steering and bow-thruster, while the master sat in the starboard chair, from where he could also see a radar, and had control of the main engine.

The ship left Goole, and the passage passed without incident. On passing Humber Bridge, shortly before 2300, the master was relieved by the chief mate, and went to his cabin to complete paperwork for arrival in Immingham. Half-an-hour later, the master returned to the bridge, and resumed his role as OOW. Shortly afterwards, the pilot was informed by VHF radio that a ferry inbound to the Immingham outer harbour was approaching from sea, with a similar ETA off Immingham. The pilot contacted the inbound ferry, and the ferry master agreed that the ships should pass “green to green”, with the ferry then proceeding ahead of Fast Filip. The pilot explained his intentions to Fast Filip’s master, ordered a reduction in speed and altered course towards the port side of the channel.

Once the ferry was abeam to starboard, the pilot put the helm hard-to-starboard, and asked for full ahead on the main engine. As the vessel began to turn, the ebb tide set her towards a tanker berthed at Immingham Oil Terminal. At 0003, the port quarter of Fast Filip made contact with the bulbous bow of the tanker, holing her fore peak ballast tank. Fast Filip sustained damage to her port quarter, but remained watertight.

The ebb tide pinned Fast Filip against the bow of the tanker until she had built up sufficient speed to move clear. She then proceeded into Immingham Dock without further incident.

Action taken

The Chief Inspector of Marine Accidents has written to ABP Humber Estuary Services raising his concerns at the pilot's lack of planning for the turn, his apparent lack of awareness of space, stream and speed when executing the turn, and the adverse effect that his decision to steer the vessel himself is likely to have had in this regard.

He has also written to Fast Baltic Sp z o o to highlight the following safety issues:

- The need for a helmsman to be employed so that master and pilot can effectively perform their duties concerning navigation and position monitoring
- The need for the master to be proactive in discussing any changes to the passage plan.

Published: July 2008

Published 23 January 2015

Explore the topic

[Maritime accidents and serious incidents (/transport/maritime-accidents-and-serious-incidents)](/transport/maritime-accidents-and-serious-incidents)

DFDS RESPONSE TO ExQ2

APPENDIX 6

FAST ANN

GOV.UK

Home > Marine Accident Investigation Branch reports

Parting of mooring ropes from unmanned general cargo vessel Fast Ann and subsequent contact with jetty

Location: Immingham Oil Terminal, England.

From:
Marine Accident Investigation Branch (/government/organisations/marine-accident-investigation-branch)

Published
23 January 2015

Vessel type: **Merchant vessel 100 gross tons or over** (/maib-reports?vessel_type%5B%5D=merchant-vessel-100-gross-tons-or-over)
Report type: **Completed preliminary assessment** (/maib-reports?report_type%5B%5D=completed-preliminary-examination)
Date of occurrence: **19 January 2010**

Completed PE Summary: Fast Ann

A short summary of the accident and action taken:

	Merchant Vessel/Accident Details
Vessel Name	Fast Ann
Registered Owner	Acetech Construction Ltd
Port of Registry	De-registered
Flag	None
Type	General cargo

	Merchant Vessel/Accident Details
Built	1980
Construction	Steel
Length Overall	85.86m
Gross Tonnage	1740
Date/Time	19/01/2010, 0058 (UTC)
Location of incident	Immingham Oil Terminal
Incident Type	Equipment failure and contact
Persons Onboard	Unmanned
Injuries/Fatalities	None
Damage/Pollution	Damage to vessel's bow structure and starboard side railings and damage to the oil terminal's structure to support the pipelines

Synopsis

Fast Ann a decommissioned and unmanned cargo vessel waiting to be dismantled, parted her moorings on an ebb tide in dense fog in the River Humber. Her radar echo was acquired and tracked by Humber Vessel Traffic Services (VTS), who made several unsuccessful attempts to establish communications with the unknown contact. A pilot vessel and two tugs were then tasked to investigate. One of the tugs managed to identify the vessel and made fast a tow line to her stern. Dense fog and a strong ebb tide of about 4 knots hindered the efforts of the tug, which could not prevent Fast Ann from making contact with the Immingham Oil Terminal structure.

Actions taken

Acetech Construction Ltd has:

- Reviewed its procedures on mooring decommissioned vessels.
- Submitted proposals to Humber Estuary Services on future securing arrangements.
- Invited Humber Estuary Services to inspect securing arrangements.

- Undertaken to keep the site manned for the first four high tides following a mooring operation.

Humber Estuary Services has:

- Reviewed its risk assessment on the hazards of mooring breakouts and, as a result, has introduced further control measures.
- Agreed on the feasibility of the proposals submitted by Acetech Construction Ltd and has inspected the site.
- Undertaken to review the performance of VTS and the assets deployed so as to take forward any lessons from this accident.

Published: 22 February 2010

Published 23 January 2015

Related content

Person overboard from cable laying vessel Tycom Reliance with loss of 1 life (/maib-reports/person-overboard-from-cable-laying-vessel-tycom-reliance-off-barry-wales-with-loss-of-1-life)

Close-quarters situation involving liquid petroleum gas tanker Monsoon and its contact with mooring dolphin (/maib-reports/close-quarters-situation-between-liquid-petroleum-gas-tanker-monsoon-with-outbound-vessel-on-the-river-humber-england-resulting-in-contact-with-mooring-dolphin)

Fire in engine room of general cargo vessel Saline (/maib-reports/fire-in-engine-room-of-general-cargo-vessel-saline-while-in-the-approaches-to-the-humber-estuary-england)

Grounding of bulk carrier Lowlands Maine (/maib-reports/grounding-of-bulk-carrier-lowlands-maine-on-the-varne-bank-dover-straits-off-the-south-east-coast-of-england)

Contact made by offshore supply vessel Caledonian Victory with berth and 7 moored small craft with 3 sinking (/maib-reports/contact-made-by-offshore-supply-vessel-caledonian-victory-with-ro-ro-berth-and-7-moored-small-craft-while-moving-berth-in-aberdeen-scotland-with-3-of-the-moored-craft-sinking)

Explore the topic

Maritime accidents and serious incidents (/transport/maritime-accidents-and-serious-incidents)