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

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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.

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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.

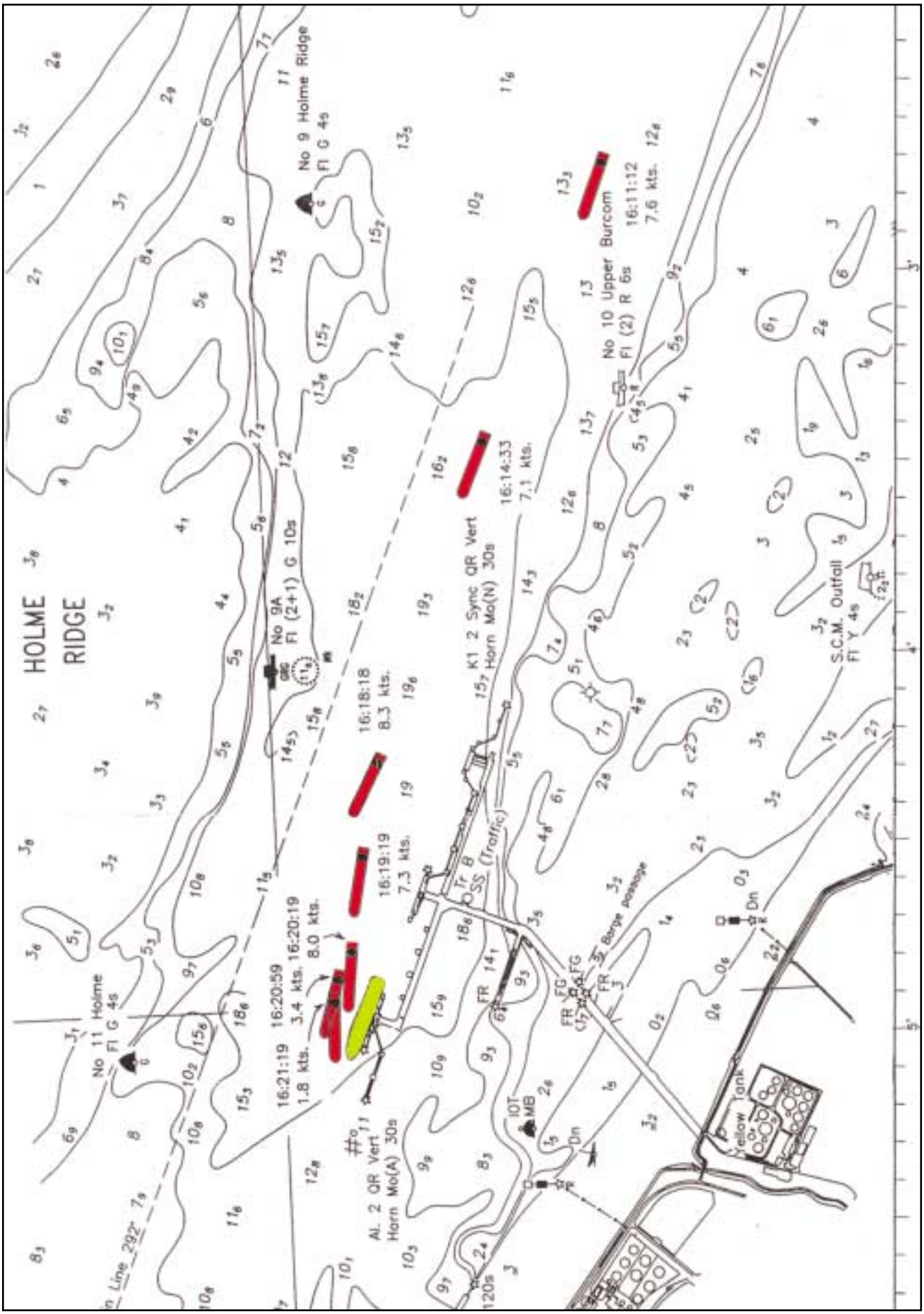
At 1617, as she passed IOT No 3, the vessel started to swing gradually to port. The pilot ordered the helm hard to starboard. The rudder indicator confirmed the helm was to starboard, but the vessel did not respond. Half Ahead was then ordered by the pilot, who also directed *Lady Cecilia* to take some 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.



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.

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 BUIK CARRIER CO, ITD

SHIP'S PARTICULARS

M.V. "XUCHANGHAI" PANAMA OFF.NRL 25715 PEXT G. T. 10,070.00 N. T. 9,485.00

IMO No. 9158379.

Ship's name:	XU CHANG HAI	Type:	Bulk/Timber
Call sign :	3 P 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	~~35554.30~~	~~27899.30~~
Fresh	10.039	3.901	34766.60	27114.6
Winter	9.612	4.328	33969.73	26317.73
Draft for Timber Cargo:				
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% 131.75M^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.

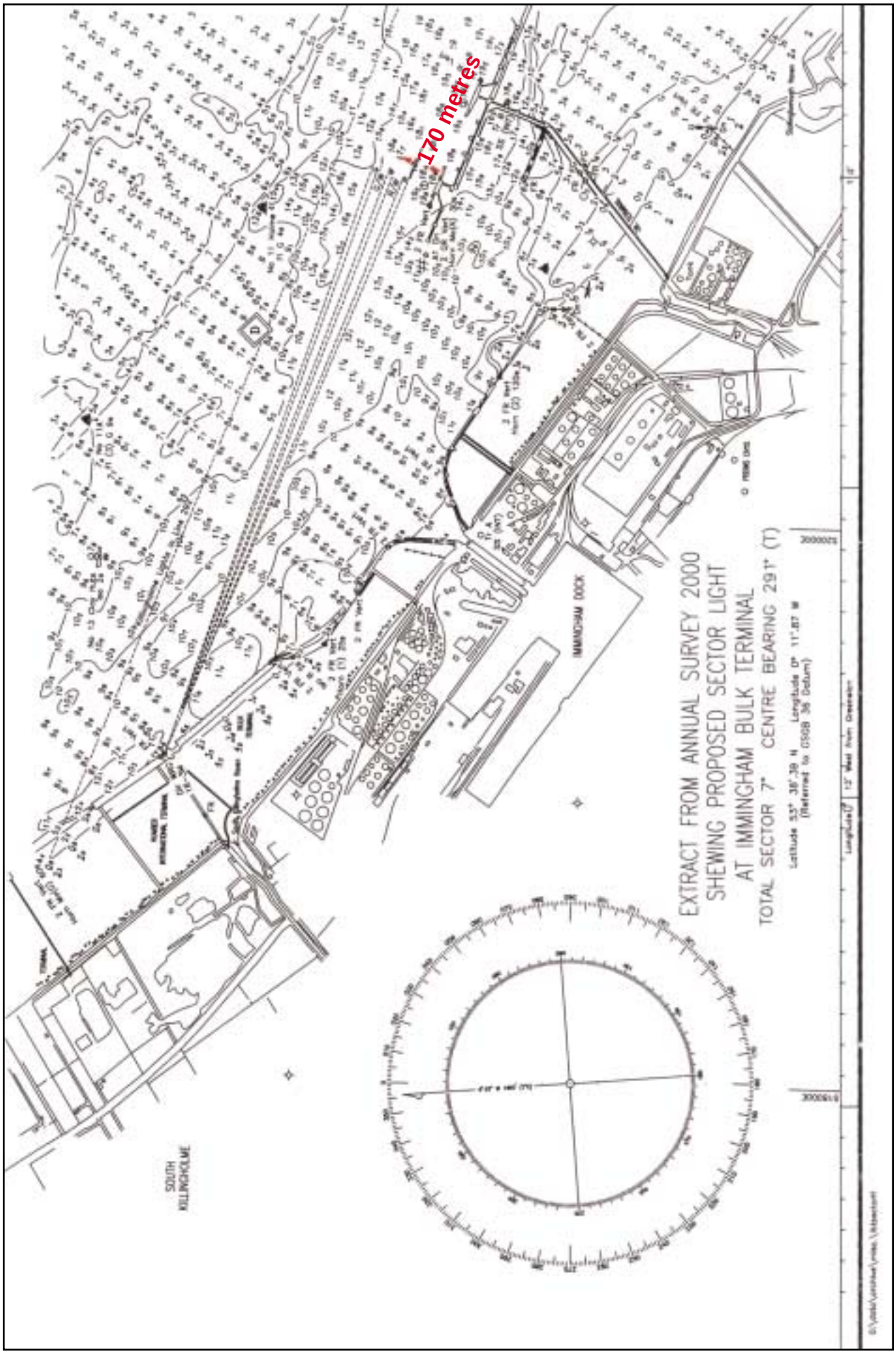
1.14.2 New light on the Humber International Terminal

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
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