



Report 01-204

tug *Nautilus III*

capsize and sinking

Auckland Harbour

9 March 2001

Abstract

On Friday 9 March 2001, at about 0725, the tug *Nautilus III* was towing the laden hopper barge *H7* in Auckland Harbour when the barge took a sheer to starboard. The tug skipper manoeuvred the tug in an attempt to arrest the sheer but the tug was girted, capsized, and sank. The skipper of the tug swam clear and was not injured.

The main factors contributing to the accident were the short length of the towline in use, the set-up of the towline and the compromise of the watertight integrity of the tug.

Safety issues identified included:

- the safe ship management manual operating procedures
- poor communication between all parties involved
- the unplanned approach to short towing operations.

Safety recommendations were made to the owners of the *Nautilus III* and *H7* to address the safety issues.

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Nautilus III

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Glossary

abeam	direction at right angles to the fore and aft line of a vessel
aft	rear of the vessel
athwartships	transversely across a vessel
beam	width of a vessel
Beaufort scale	system of estimating wind speed
bollard	firmly secured post of circular section used to secure ropes
bollard pull	measure of the static pull a vessel can exert
bowse	to exert a downward pull on a rope
bulkhead	nautical term for wall
by the head	said of a ship when its draught forward is greater than its draught aft
chart datum	zero height referred to on a marine chart
dolphin	structure used for mooring ships
draught	depth in water at which a vessel floats
girted	condition of a tug when it is heeled by the direction of pull on a towline and is in danger of capsizing
gob line	a line used to bowse a towline to move the towing point aft
gross tonnage	a measure of the internal capacity of a ship; enclosed spaces are measured in cubic metres and the tonnage derived by formula
H frame	post on a tug for securing the towline
heel	angle of tilt caused by external forces
knot	one nautical mile per hour
kort nozzle	solid shroud around the propeller of a vessel
port	left-hand side when facing forward
spring tide	period of highest and lowest tides in a lunar cycle
stability	property of a ship by which it maintains a position of equilibrium, or returns to that position when a force that has displaced it ceases to act
starboard	right-hand side when facing forward
track	the path intended or actually travelled by a ship
trim	difference between the forward and aft draughts of a floating vessel
yaw	to swing to either side of an intended course

List of Abbreviations

kW	kilowatt
m	metre(s)
m ³	cubic metres(s)
mm	millimetre(s)
MSA	Maritime Safety Authority
nm	nautical mile(s)
SOLAS	Safety of Life at Sea
t	tonne(s)
UTC	universal time (co-ordinated)
VHF	very high frequency

Data Summary

Tug particulars:

Name:	<i>Nautilus III</i>
Type:	tug
Class:	Lloyds 100 A1 tug
Operating limits:	restricted coastal
Length overall:	14.16 m
Breadth:	5.27 m
Draught:	1.83 m forward 2.44 m aft (approximate)
Gross tonnage:	30 t
Bollard pull:	9 t
Service speed:	9 knots
Built:	1971 at Carrington Slipways Proprietary Limited, Newcastle, Australia
Construction:	steel
Propulsion:	two 8V71N Detroit diesel engines, each producing 168 kW, and driving 3-bladed fixed pitch propellers encased in rotating kort nozzles
Owner/operator:	Thomson Towboats Limited

Barge particulars:

Name:	<i>H7</i>
Type:	hopper barge
Operating limits:	coastal (but not permitted to operate in weather conditions more than force 4 on the Beaufort scale)
Length:	47.64 m
Breadth:	8.07 m
Gross tonnage:	190 t
Owner:	Ports of Auckland Limited

Location: Auckland Harbour

Date and time: Friday 9 March 2001 at about 0725¹

Persons on board:

<i>Nautilus III</i>	crew:	1
<i>H7</i>	crew:	1

Injuries: nil

Nature of damage: minor to superstructure and hull
extensive water damage

Investigator-in-charge: Captain W A Lyons

¹ All times in this report refer to New Zealand Daylight Time (UTC +13 hours) and are expressed in the 24 hour mode.

1. Factual Information

1.1 History of the trip

- 1.1.1 At about 0700 on Friday 9 March 2001, the skipper and deckhand of the *Nautilus III* arrived at the tug, started the engines and prepared the vessel for the day's work.
- 1.1.2 Their first job of the day was to tow hopper barge *H7*, which was loaded with dredgings from the harbour, from Marsden Wharf to the mixing barge anchored in Mechanics Bay, a distance of about 1 nm. *H7* was due at the mixing barge at about 0730 (see Figure 1).
- 1.1.3 The mixing barge was used to unload the hopper barges and treat the dredgings before they were used as fill for land reclamation in Mechanics Bay. Thomson Towboats Limited was not contracted to tow the hopper barges, but did so on occasions when requested.
- 1.1.4 At about 0705 the *Nautilus III* departed the wharf and headed towards the barge with the skipper operating the tug from the flying bridge. He called Auckland Harbour control on the very high frequency (VHF) radio and advised them of the intended trip and asked if there were any shipping movements. He was told that there were 2 ships inbound; one was due at the container terminal at 0800. He told harbour control that he would stay close to the terminal and be clear by the time the ship arrived.
- 1.1.5 The skipper and deckhand decided they would tow *H7* rather than make the tug fast alongside as they did not know which side of the mixing barge the operator wanted *H7*. The skipper felt that towing *H7* would be easier than making fast to it and then finding out that they would have to let go and make fast again to the other side to meet the requirements of the mixing barge. The skipper later stated that if he had known which side was required alongside the mixing barge he would probably have secured the tug alongside *H7* and "pushed" it around to the mixing barge.
- 1.1.6 The towline they used was a 20 m length of 60 mm diameter polypropylene multiplait rope with a soft eye spliced in each end. One eye of the towline was looped over the H post on the tug. The skipper backed the *Nautilus III* up to the bow of *H7* and the deckhand transferred across and put the other eye over the starboard bollard on the bow of *H7* (see Figure 2).
- 1.1.7 At about 0710 the deckhand let the mooring lines go from the wharf and decided he would stay aboard *H7* and tidy up the mooring lines on the way around to the mixing barge. The skipper and deckhand had not discussed this but it was not an unusual practice.
- 1.1.8 The skipper manoeuvred *H7* off the wharf, and once *H7* was about 80 m off and parallel to the wharf the skipper increased to full power. When the barge was about 100 m from the end of the wharf he turned the tow to starboard to head down the harbour.
- 1.1.9 As the tow proceeded down the harbour the skipper noticed that *H7* was yawing up to about 40 degrees either way so he reduced the engine power to just over half. The tow continued past Bledisloe Terminal at a speed the skipper estimated to be about 4 knots through the water. *H7* was still yawing but due to the reduction in speed the period of the yaw cycle had increased.
- 1.1.10 The skipper was adjusting the course of the tug with the cycle of the yaw. As *H7* yawed he would alter the course of the *Nautilus III* slightly in the opposite direction to keep the towline leading over the stern of the tug. The deckhand was busy tidying the mooring lines on *H7* and did not take much notice of the progress of the tow. When the tug slowed down he looked up and saw the skipper of the tug indicate by hand signal that the barge was yawing.

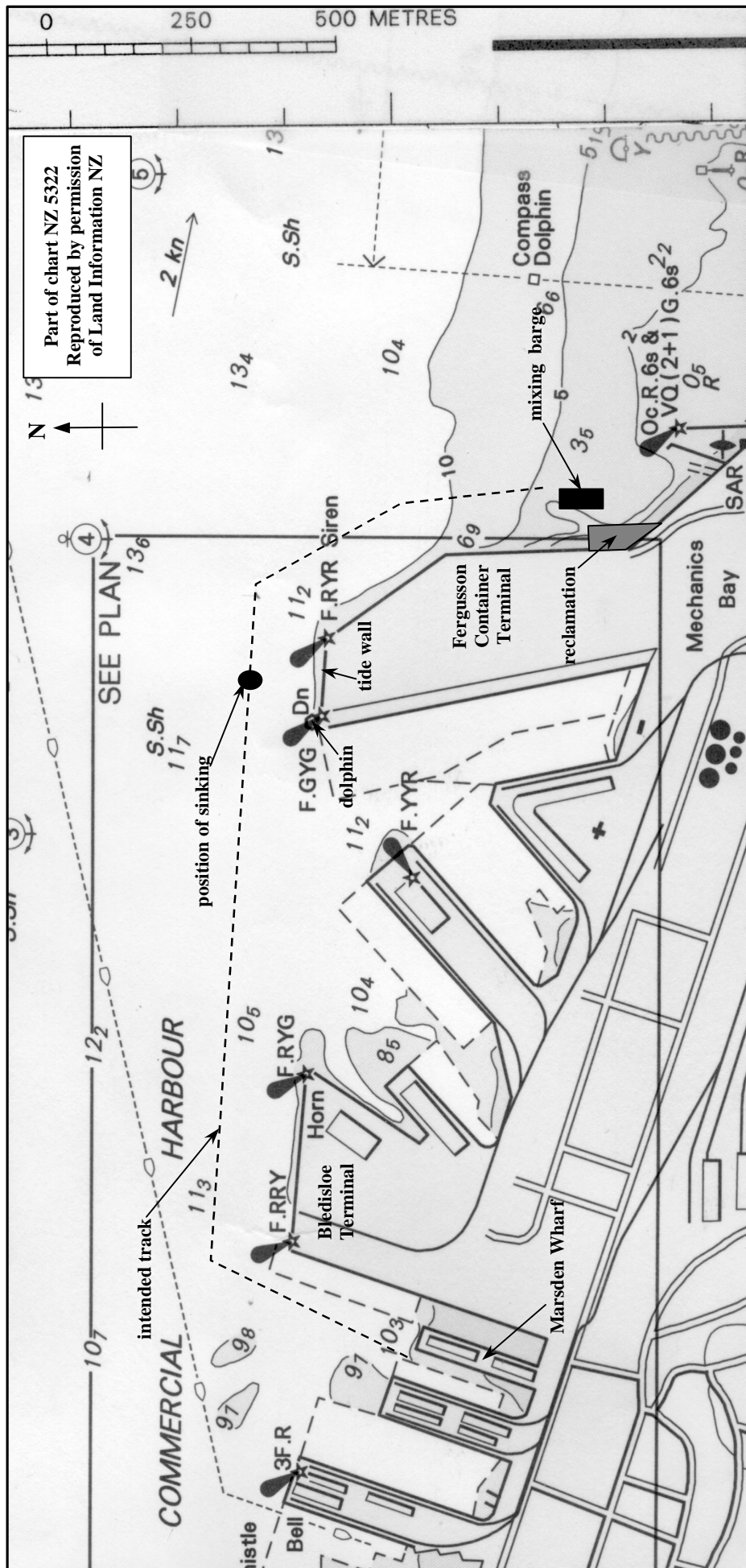


Figure 1
Part of chart NZ 5322 showing the area of the accident

- 1.1.11 At about 0720 the tow passed about 100 m off the dolphin at the western end of the tide wall on the end of Fergusson Container Terminal, still travelling at about 4 knots through the water. Shortly after, *H7* yawed to starboard about 60 degrees, and was heading for the eastern end of the tide wall. The skipper of *Nautilus III* applied power in an attempt to arrest the yaw. The skipper recalled that at this point the towline was still over the stern of the tug. *H7* continued yawing to starboard, and had begun to overtake the tug which altered the direction of pull on the towline more towards the beam of the tug, causing it to heel to starboard.
- 1.1.12 In an attempt to get the towline back over the stern of the tug, the skipper altered the course of the *Nautilus III* further to port until he recalled he was heading roughly north. *H7* did not respond and *Nautilus III* was girted with the towline leading close to abeam on the starboard side. The heel of the tug increased until the sill of the watertight door to the accommodation, which was open and hooked back to the bulkhead, was submerged and down flooding commenced (see Figure 3).
- 1.1.13 The tug skipper realised that he would not be able to manoeuvre the tug back to starboard and get ahead of the barge so he made the decision to try and turn the tug further to port so it would lie bow to stern with *H7*. To try and achieve this he put both steering nozzles to amidships and the port engine astern, leaving the starboard engine ahead.
- 1.1.14 The deckhand was on the bow of *H7*, facing aft, still coiling down one of the mooring lines when he noticed the *Nautilus III* out of the corner of his eye. He looked at the tug and saw it was heeled to starboard and down by the head with water entering the starboard engine room ventilator. His immediate reaction was to look to cut the towline. He noticed that it had chaffed about halfway through where it went over the bow of *H7* but he could not find anything close by on *H7* with which to sever it.
- 1.1.15 As the tug rolled onto its starboard side the towline went slack and floated clear of the H post on the tug. The skipper swam clear, pulled himself along the towline and climbed onto the barge. The *Nautilus III* sank quickly, coming to rest on the seabed on its starboard side.
- 1.1.16 The skipper later estimated that it was about 15 seconds from the time he realised that the tug was girted until he swam clear. Meanwhile, *H7* had rounded up to port and drifted to a stop. Another harbour tug soon arrived and took *H7* in tow.
- 1.1.17 Some diesel oil escaped from the fuel tanks of *Nautilus III* causing minor pollution, but by 1005 divers had sealed the tanks. As the *Nautilus III* presented a danger to navigation, salvage was commenced almost immediately. A barge was moored over the wreck and divers shackled 4 wire strops to existing lifting lugs on the tug. At about 1500 the floating crane *Hikanui* was manoeuvred into position and lifted the *Nautilus III* from the seabed. It was then pumped out and refloated.



Figure 2
Empty hopper barge *H7* alongside the mixing barge



Figure 3
The *Nautilus III* during salvage; note open watertight door

1.2 Personnel information

- 1.2.1 The skipper of *Nautilus III* was 31 years old. He had grown up around boats and after leaving school was employed on various fishing boats. He was then employed as general hand at a ship repair and maintenance company and gained sea time working part time on harbour ferries. He gained a commercial launch master certificate in 1992 and was employed as skipper by Fullers Group Limited on their smaller harbour ferries. In 1995 he obtained an engineer of local motor ship certificate and remained employed by Fullers Group Limited, alternating between skipper on the smaller ferries and engineer on the larger catamarans.
- 1.2.2 In 1998 the skipper was employed by Thomson Towboats Limited, originally as engineer but after 4 months he changed to skipper. Since then he had been continuously employed on the tugs engaged in many types of towage operations. He had also obtained a certificate of local knowledge for master of a tugboat under 100 gross registered tonnage, which was issued by the Auckland Regional Council harbourmaster on 7 March 2000. Knowledge of the tidal flows within the harbour was briefly covered as part of the requirement for this certificate.
- 1.2.3 The skipper estimated that he had towed *H7* and similar barges, under similar conditions, on about 4 previous occasions.
- 1.2.4 The deckhand was 21 years old. He was also a qualified skipper. He had been employed by Thomson Towboats Limited for the past 4½ years, originally as deckhand, but after obtaining his commercial launch master certificate in April 2000 he was promoted to skipper.
- 1.2.5 Both the skipper and the deckhand had worked together on many occasions, often changing roles as required. They had recently spent 3 months together on the *Nautilus III* towing similar but smaller hopper barges at the port of Napier.
- 1.2.6 The day before the accident the crew had worked a 12 hour day but considered they were rested before the accident trip. They both stated that they did not feel tired or fatigued at the time of the accident.

1.3 Tug information

- 1.3.1 The *Nautilus III* was purchased by Thomson Towboats Limited in 1997. It was one of a fleet of 4 tugs owned by the company and used in general harbour and coastal towage operations.
- 1.3.2 The *Nautilus III* was constructed of steel and built in Australia in 1971. It had 4 watertight bulkheads. The engine room was amidships. The accommodation was forward of the engine room and was split into two levels; the upper was a galley and messing area and the lower a cabin. Access to the accommodation, wheelhouse and engine room was from an alleyway just inside a watertight door on the starboard side of the main deck (see Figures 3 and 4).
- 1.3.3 The wheelhouse was enclosed and contained standard navigational equipment. The flying bridge provided an alternative conning position and was equipped with engine and steering controls, VHF radio and a control to operate the deck winch.
- 1.3.4 Other than the towline in use at the time of the accident there were 2 other towlines on board the *Nautilus III*, one about 120 m long and one about 250 m long. The towlines were handled manually; the winch was small and only used for mooring lines and gob lines if used. There was a fire axe stowed just inside the watertight door on the starboard side which could also be used for cutting the towline in an emergency.
- 1.3.5 Propulsion was by two 168 kW Detroit 8V71N diesel engines, each driving a 3-bladed fixed pitch propeller through a reversing gearbox. The propellers were encased in kort nozzles, which rotated independently about 35 degrees either side of amidships to provide steerage.

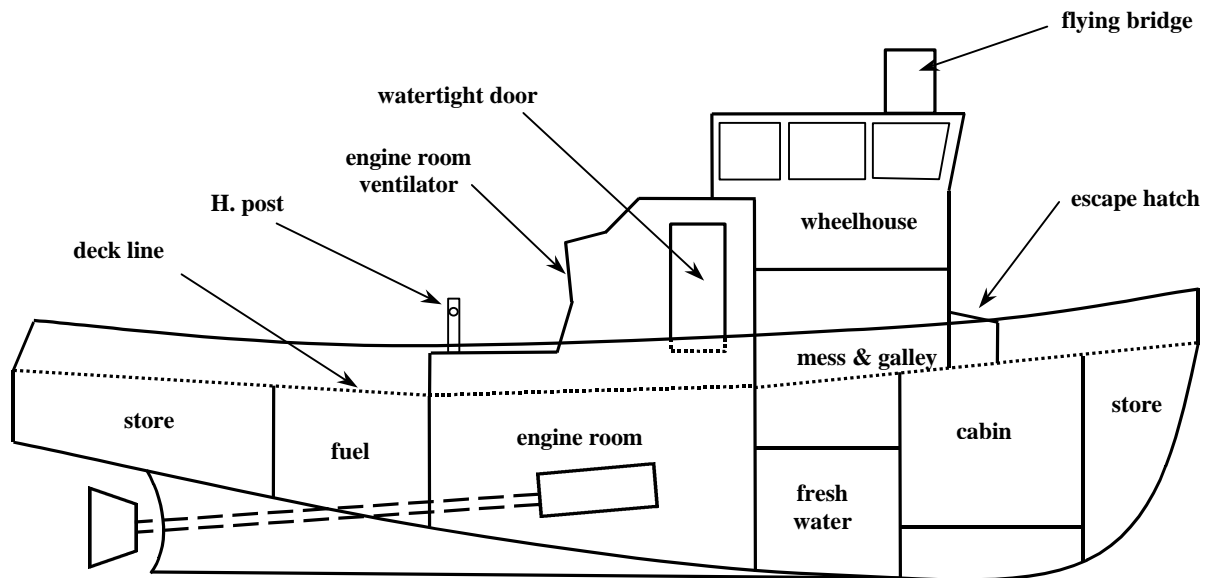


Figure 4
Profile of the *Nautilus III*
(not to scale)

- 1.3.6 When the *Nautilus III* was built 4 lifting lugs were incorporated into the hull to facilitate it being lifted out of the water by crane.
- 1.3.7 The stability data for the *Nautilus III* complied with the requirements of Maritime Rule 40C. When the *Nautilus III* arrived in New Zealand the stability data was approved by Marine & Industrial Safety Inspection Services Limited. The worked example in the data for the loaded ship condition closely resembled the condition of the *Nautilus III* on the day of the accident. In the example it is calculated that the deck edge immersion would occur at an angle of heel of about 13 degrees and the watertight door sill immersion would occur at about 52 degrees. From photographs and drawings it was estimated that the bottom edge of the starboard engine room ventilator would immerse at an angle of about 70 degrees.
- 1.3.8 The *Nautilus III* had a safe ship management certificate issued on 23 June 2000, which was valid until 30 April 2004. Section 16 of the safe ship management manual covered Shipboard Operations. The following sections were the only information on towing operations:

Movements (Towing)

All movements shall be reported to Harbour Radio on Channel 12 VHF

Towing

Tow lines should be visibly inspected before each tow.

Hatches Doors and Openings

It is the responsibility of vessel operators to assess possible danger such as compartment flooding in relation to hatches, doors and openings.

- 1.3.9 The skipper later said that he usually shut the watertight door when towing but because this was a short job it was left open. He also said that he would not normally use a short towline with 2 spliced eyes.

1.4 Barge information

- 1.4.1 Hopper barge *H7* was built in 1971 and owned by Ports of Auckland Limited. It was used for transporting dredgings from the harbour. It was of steel construction with the cargo compartment hinged along the centreline at deck level to allow the bottom of the barge to open and dump its contents. On the bow were 2 bollards, positioned about one metre each side of the centreline.
- 1.4.2 *H7* was classed as an unmanned barge but it was not unusual for it to be manned on short tows within the harbour.
- 1.4.3 *H7* had a New Zealand Barge Safety Certificate issued by the Maritime Safety Authority (MSA) on 11 November 1998 and valid until 18 June 2003.
- 1.4.4 The light displacement of *H7* was about 244 t and the hopper had a capacity of 424 m³. It was estimated that the total displacement of *H7* at the time of the accident would have been about 800 t.
- 1.4.5 The deckhand estimated that *H7* was trimmed about 300 mm by the head; the skipper thought it was only about 100 mm. The dredgings were a slurry and the hopper barges often trimmed by the head when loaded. They had a reputation amongst local tug skippers as being awkward to tow for this reason.

1.5 Weather and tidal information

- 1.5.1 The weather at the time of the accident was an easterly wind of about 5 knots, rippled sea, overcast with good visibility.
- 1.5.2 High tide was predicted for 0750 at a height of 3.4 m above chart datum. It was a period of spring tides with a full moon on 10 March.
- 1.5.3 In the shipping channel off the commercial wharves in Auckland Harbour the tidal flows run broadly in an east west direction. The line of the commercial wharves protrudes out from the shore, disturbing this flow and causing it to eddy amongst and close to the ends of the wharves.
- 1.5.4 Fergusson Container Terminal is built on reclaimed land and was the most eastward of all the commercial wharves. It protrudes out at right angles into the channel, and as a result it was not uncommon to experience strong and variable tidal eddies off the terminal, where the accident occurred.
- 1.5.5 Various local tug skippers felt that since the land reclamation east of Fergusson Container Terminal had begun, the tidal flows in the area of the accident had changed and increased in velocity.

1.6 Legislation

1.6.1 Maritime Rule Part 40C, Design, Construction and Equipment, Non-Passenger Ships that are not SOLAS ships, came into force on 1 February 2001. Section 60 covered towing gear and read as follows:

Towing Gear

Any ship that is fitted with means of towing other ships must meet the following requirements:

- (a) the design of the towing gear must be such as to minimise any heeling moment due to the lead of the towline. For this purpose, the towing hook or post or towing winch, and any towing fairleads, must be located at the minimum practicable height above the waterline
- (b) towing hooks and bollards must have positive means of quick release that can be relied on to function correctly under load and for all directions of applied load and expected heel angles²⁷
- (c) towing winches must have an emergency means of rapidly paying out when under load
- (d) the towing gear and the supporting structure must be strong enough to withstand loads imposed during towing operations. The towing line must be the weakest link in the towing arrangement

²⁷ It is recommended that the release mechanism be controlled from the wheelhouse and at the hook or bollard itself. The local control at the hook or bollard should preferably be of the direct mechanical type capable of independent operation

1.6.2 The MSA was asked to clarify the intent of this rule and responded, in part:

The quick release is not actually the bollard but a device fitted within the towline close to the bollard . . .

Bollard encompasses all forms of fixed towing, i.e. “stag horns”, post, bollards, ‘H’ posts etc . . .

Therefore under rule 40C. 60 any ship involved in towing from a hook or “bollard” must have some form of quick release, and it is recommended that this release is operable from both local and wheelhouse positions. An axe does meet the requirement of a quick release device in accordance with the rule, but it does not meet the requirements of the recommendations in the footnotes . . .

2. Analysis

2.1 The operation was conducted by a crew experienced in harbour towage. They had worked together on many occasions conducting similar operations, although not often with *H7*. On the day of the accident they did not discuss the operation in depth. The skipper was not aware that the deckhand was going to stay aboard *H7* for the trip. Although this was not an unusual practice it left the skipper alone on the tug, more or less confined to the controls on the flying bridge. There were a number of considerations that should have been taken into account to better facilitate a one-man operation on both the *Nautilus III* and *H7*.

2.2 When towing, it is imperative that provision is made to be able to release or slacken the towline if necessary. Having both eyes of the towline attached to fixed points without a quick release mechanism left the skipper without this option. It would have been prudent to have used one of the longer towlines available with the eye on the barge and the other end turned up on the towing post so it could be slackened off if necessary.

- 2.3 When towing, the towline is usually controlled from the tug. In this case, with only the skipper aboard the *Nautilus III* it is doubtful whether he would have been able to leave the flying bridge and attend to the towline in the short period of time in which the situation developed. One option available was to have the eye of the towline fast on the tug and the slack adjusted by the deckhand from the bow of *H7*. In such a case good means of communication between the skipper and deckhand by radio, hand signals or some other means would be essential. With the deckhand on the barge, some means for him to cut the towline should also have been available.
- 2.4 The intent of Maritime Rule Part 40C, as described by the MSA, allowed the use of an axe as a “positive means of quick release that could be relied on to function correctly under load and for all directions of applied load and expected heel angles”. It is debatable whether a deckhand wielding an axe to a towline under load from the deck of a tug over on its side could be described as reliable; nevertheless, this has been accepted in the industry for a long time. With the deckhand on the barge without an axe, and the skipper confined to controlling the tug, the *Nautilus III* tow operation on the day did not comply with the intent of Rule Part 40C.
- 2.5 When loaded with dredgings *H7* usually trimmed by the head, and had a reputation as being awkward to tow for this reason. Being down by the head would create a natural tendency for the barge to yaw under tow. Lengthening the towline can reduce the yaw and its effect on the progress of the tow, but the skipper was unable to do so because the towline was fixed at each end. The barge was reportedly yawing 40 degrees either side of the intended track before the tow entered the area of tidal eddies and conflicting tidal flows. This was an indication of poor tow geometry.
- 2.6 The sheer to starboard that *H7* took could have been a natural progression of the poor towing geometry and the technique used to try and arrest the yaw or it could have been the result of the tug and barge being affected by conflicting tidal currents, or a combination of both.
- 2.7 The skipper was aware of the conflicting tidal flows off Fergusson Container Terminal. Although he had informed harbour control that he would stay close to the container terminal he had the option of passing further off, where the tide flow was more constant and he would have had more room in which to manoeuvre.
- 2.8 The winch was not suitable for handling the towline but it could have been used to attach a gob line to the towline. This would have moved the towing point further aft. The effect of this is twofold; it restricts the movement of the towline to the centre of the stern, but at the same time also restricts the tug’s manoeuvrability around the towing point. If a gob line had been used on the towline it would have ensured that when the towline had become misaligned with the centreline of the *Nautilus III* the subsequent pull exerted by the barge would have slewed the stern of the tug to realign with the towline and prevented an athwartship force being exerted near the tug’s mid-length, causing it to heel.
- 2.9 For a gob line to be effective it needs to be of adequate size, properly set up and capable of being quickly and easily adjusted. It is debatable whether the use of a gob line is practical when towing short distances, as was the case on the day of the accident. The loss of manoeuvrability of the tug could increase the possibility of losing control of the barge, particularly when a short towline is being used.
- 2.10 No prior arrangements had been made with the operator of the mixing barge. If the skipper had known which side of *H7* was required alongside the mixing barge he could have secured the tug to *H7* at Marsden Wharf and “pushed” it around to the mixing barge without having to let go. It was possible for the mixing barge to be contacted by VHF radio or cellular telephone to make such arrangements.

- 2.11 Securing the tug alongside the barge normally gives the tug skipper more control over the barge. Tug skippers are sometimes reluctant to secure alongside a barge in a busy waterway, as the wakes of passing vessels can cause the tug to bump against the barge and sustain damage. However, securing the tug alongside the barge and “pushing” it would have been preferable to towing the barge, and would have been overall a safer and more controlled operation.
- 2.12 The watertight door on the starboard side of the *Nautilus III* was left open. The decision to leave the door open decreased the angle of heel at which down flooding occurred by about 20 degrees. The size of the door opening significantly increased the rate of down flooding when it did occur.
- 2.13 Once the sill of the watertight door was immersed, at angle of heel of about 52 degrees, the resulting down flooding would have rapidly increased the heel until the starboard engine room ventilator also became immersed. It is possible that if the door had been shut the skipper may have had time to manoeuvre the tug out of trouble or the towline might have parted before significant down flooding occurred through the engine room ventilator.
- 2.14 When clear of Marsden Wharf the skipper initially reduced the speed of the *Nautilus III*. This had the effect on *H7* of slowing the period of yaw rather than decreasing the angle of it. To significantly decrease the angle of yaw would have required a major reduction in speed or the towline to be significantly lengthened, an option unavailable to the skipper with the towline in use.
- 2.15 The condition of the *Nautilus III* at the time of the accident was within the approved stability criteria for the tug. When the *Nautilus III* became girted the momentum of the barge submitted it to forces greater than it could sustain. The rate of down flooding through the open door would have quickly decreased the tug’s stability to a point where sinking was inevitable.
- 2.16 When the *Nautilus III* was heeled over and became girted the action of the skipper in trying to turn the tug further to port was probably the only option left to him. At this point the tug was already taking water and would have been difficult to manoeuvre and slow to respond, capsizing was probably imminent.
- 2.17 Given that towing was the primary activity of the tug, the safe ship management manual for the *Nautilus III* contained surprisingly little instruction on the safety aspects of towing and related company procedures.
- 2.18 The sinking of the *Nautilus III* was caused primarily by lack of planning and communication as well as non-compliance with safety precautions and basic towing techniques. This accident is a prime example of how accidents can occur just as readily during a short harbour tow as they can on an ocean towing operation, arguably more readily so.

3. Findings

- 3.1 The *Nautilus III* was operating under a safe ship management system and had a current maritime document at the time of the accident.
- 3.2 The crew of the *Nautilus III* held appropriate qualifications and had sufficient experience for their positions.
- 3.3 The crew were adequately rested and not fatigued at the time of the accident.
- 3.4 The design and power of the *Nautilus III* were adequate to tow and manoeuvre *H7* when loaded.

- 3.5 The hopper barge *H7* was trimmed by the head, and the towline between it and the tug *Nautilus III* was too short, which together made for poor tow geometry and caused the barge to yaw excessively.
- 3.6 The tug *Nautilus III* was girted and capsized by the barge *H7* when the barge took a large uncontrolled sheer to starboard. The sheer was probably caused by a combination of poor tow geometry, the technique used to control the yaw, and the tug and barge being affected by differing tidal currents.
- 3.7 The *Nautilus III* sank due to excessive down flooding through an open watertight door. The tug probably would not have sunk had the watertight door been closed.
- 3.8 The use of a fixed eye at each end of the towline and the inability to slack, release or sever it in an emergency significantly reduced the options available to the crew when the emergency developed, and did not comply with Rule Part 40C.
- 3.9 The lack of effective planning and communication for this short towing job made the operation susceptible to increased risk and the safe ship management manual for the *Nautilus III* contained little to enhance the safety of the operation and provide company guidelines.

4. Safety Recommendations

- 4.1 On 9 July 2001 the Commission recommended to the owner of *Nautilus III* that he:
- 4.1.1 Revise the safe ship management manual to reflect company policy and standing orders with regard to:
- towing operations
 - towing equipment
 - crew safety
 - water tight integrity
 - emergency procedures
 - communication between all parties involved in a towing operation. (029/01)
- 4.2 On 9 July 2001 the Commission recommended to the manager marine services for Ports of Auckland Limited that he:
- 4.2.1 Supply a means whereby a towline can be severed in an emergency aboard the barges +- owned by his company. (030/01)

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Hon. W P Jeffries
Chief Commissioner