

Report on the investigation of the collision of
Dole America
with the Nab Tower in the eastern approaches to The Solent
on 7 November 1999

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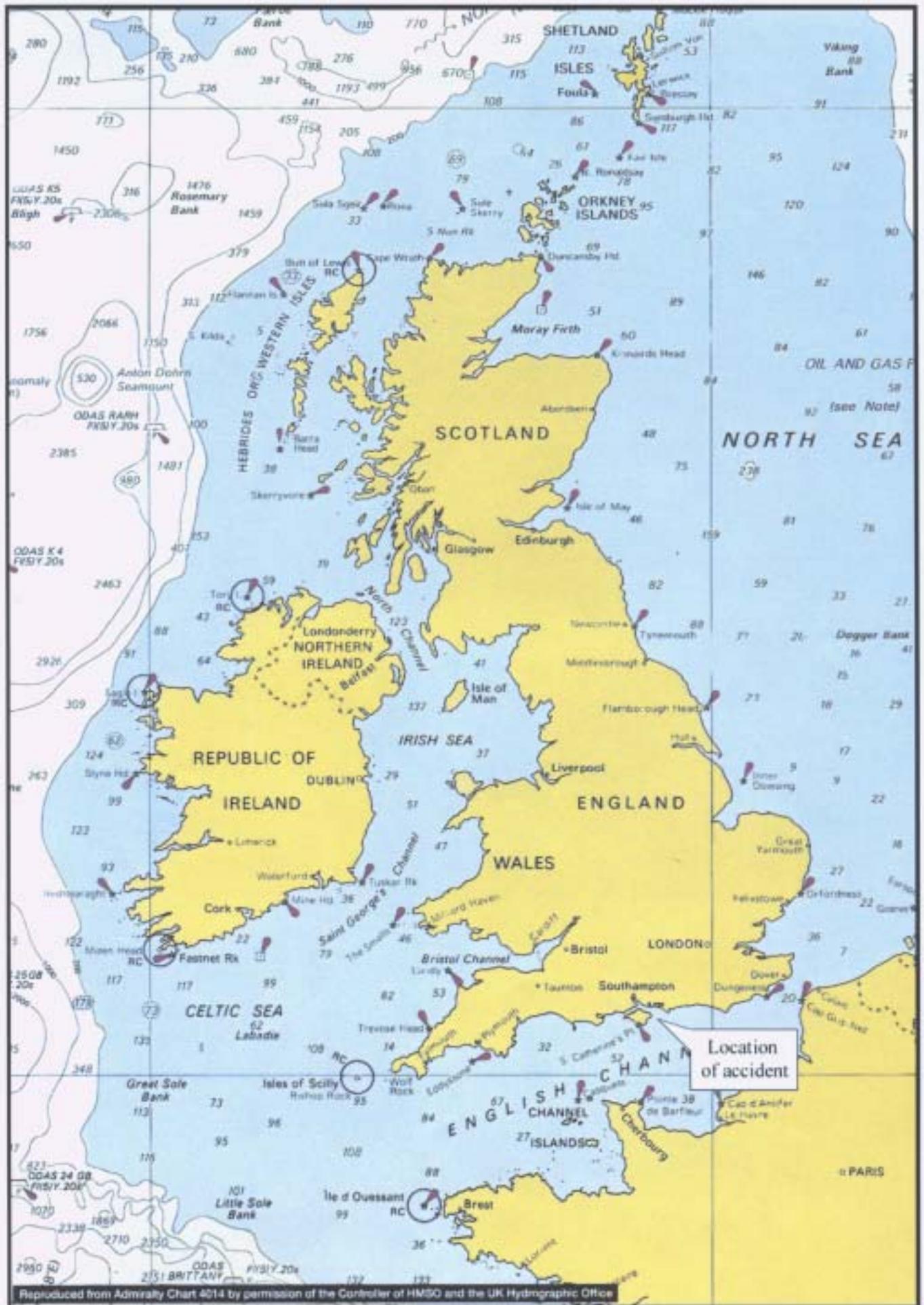
The fundamental purpose of investigating an accident under these Regulations is to determine its circumstances and the causes with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary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

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GLOSSARY OF ABBREVIATIONS

ARPA	Automatic radar plotting aid
COLREGS	<i>International Regulations for Preventing Collisions at Sea</i>
GPS	Global positioning system
ICS	International Chamber of Shipping
IMO	International Maritime Organization
kW	Kilowatts
MAIB	Marine Accident Investigation Branch
MRSC	Maritime Rescue Sub-Centre
QHM	Queen's Harbour Master
Racon	Radar transponder beacon
RNLI	Royal National Lifeboat Institution
rpm	revolutions per minute
UTC	Universal co-ordinated time
VTS	Vessel Traffic Services



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SYNOPSIS

At 0402 (UTC) on 7 November 1999, *Dole America*, a Liberian-registered refrigerated cargo vessel, collided with the Nab Tower in the eastern approaches to The Solent. The accident was reported to the MAIB, and an investigation was started the following day.

The vessel left her berth at Portsmouth at 0250, and proceeded under pilotage to the vicinity of the New Grounds buoy, about 2 miles to the north of the Nab Tower, where the pilot disembarked. Having dropped the pilot, the master began to increase speed, and ordered port helm to set a course to pass about 2 cables to the east of the Nab. As the vessel approached the tower, the master saw what he thought was a red light of another vessel at close range on the starboard bow and presenting a risk of collision. He ordered starboard helm before going to the front of the bridge to confirm what he thought he had seen. The second officer, who was the only other person on the bridge apart from the helmsman, joined him and confirmed the presence of a red light and said he saw a second to starboard of the first. The master then ordered hard to starboard helm.

When no further lights were seen ahead, he ordered hard to port helm, still with the intention of passing to the east of the Nab Tower. From his position by the window at the front of the bridge, the master was unaware of the vessel's heading and her exact position in relation to the tower. He failed to take full account of the advance and transfer of his intended actions, given that the helm was hard to starboard and *Dole America* was swinging to starboard at the time of his order.

Shortly afterwards, *Dole America* collided with the tower's foundation, bounced off, and then made contact a second time. She was damaged forward on the starboard side by Nos 2 and 3 holds and aft below the main deck but above the waterline. She started to take water and developed a 12° starboard list. The pilot subsequently re-boarded and, with the agreement of the master, ran the vessel aground on Horse Tail bank, approximately 2 cables to the north of the Dean Tail buoy.

The immediate cause of the collision was the master's inappropriate and unquestioned helm order to port. Contributory causes included his perceived need to alter course to starboard for what he took to be a crossing vessel, his plan to pass to the east of the tower, his lack of situational awareness, and the probability that fatigue and stress might have adversely affected his perception and decision-making abilities.

Recommendations are addressed to Reefership Marine Services (Dole Fresh Fruit International Ltd) with respect to pilotage passage planning, bridge manning and bridge teamwork.

PARTICULARS OF VESSEL AND ACCIDENT

Name	:	<i>Dole America</i> (Figure 1)
Official number	:	9992
Port of registry	:	Monrovia, Liberia
IMO number	:	9046502
Gross tonnage	:	10,584
Summer deadweight	:	10,282
Overall length	:	150.30m
Breadth	:	22.60m
Summer draught	:	9.10m
Year of build	:	1994
Type	:	Refrigerated cargo vessel
Main engine	:	Hyundai - B&W Type 6S60 MC 11,400kW at 105 rpm; 21.9 knots
Propulsion	:	Single propeller
Owner	:	DFF Funding IV Inc
Operator	:	Reefership Marine Services (Dole Fresh Fruit International Ltd)
Classification society	:	Det Norske Veritas
Date and time of incident	:	7 November 1999, 0402 (UTC)
Place of incident	:	Nab Tower, eastern approaches to The Solent
Injuries	:	None
Damage	:	Holed in three places above and below waterline
Pollution	:	5,200 litres of lubricating oil were lost

Figure 1



Dole America

SECTION 1 - FACTUAL INFORMATION

(All times are UTC) (All courses are true)

1.1 Background

At the time of this accident Dole Fresh Fruit International Ltd managed 19 refrigerated cargo vessels worldwide.

Dole America was one of four sister vessels, each similarly equipped and operating a four-week round trip between Costa Rica, Puerto Rico and Antwerp. They were scheduled so that one arrived in Antwerp each Sunday evening to begin discharging bananas for the European market on Monday morning.

Dole Fresh Fruit International Ltd had recently introduced a call at Portsmouth into the schedule. Each vessel was required to discharge a part cargo there before travelling on to Antwerp. *Dole America* was the second vessel to visit Portsmouth on this revised schedule.

1.2 Narrative

1.2.1 Passage to Portsmouth

Dole America left San Juan, Puerto Rico, on 29 October 1999 and crossed the Atlantic Ocean on a great circle track to make her landfall off the Bishop's Rock, Isles of Scilly. North-westerly gales during 3, 4, and 5 November reduced her average passage speed to about 20 knots. During the adverse weather she rolled continuously to about 25° each way, and occasionally to 35°. On 4 and 5 November, she was hove-to for about half-an-hour for the cargo lashings and anchors to be checked.

Dole America's scheduled time of arrival at the pilot boarding point, 1 mile west of the Nab Tower, had been 1030 on 6 November. However, the adverse weather delayed her so that she would miss the tide she was aiming for. This necessitated her having to make a later entry to Portsmouth, and her pilot was therefore ordered for 1530. She arrived at a position about 6 miles to the south of the Nab Tower at about 1400, and then drifted before arriving in the vicinity of the tower shortly before 1600. The pilot boarded at 1552 and took her into Portsmouth. She berthed shortly before 1800.

1.2.2 At Portsmouth

The vessel was expected to leave Portsmouth at 2400. The master dealt with arrival formalities, and then went to bed at 1930. The chief officer was in charge of cargo operations, and was on duty with the third officer. He called the master at 2100 because the port health officer required a health declaration and other papers. The master provided the required documentation, and then went back to bed at about 2115. He was unable to sleep and, having set his alarm clock for 2315, arose at that time and went to the office. The second officer, who kept the 12 to 4 watch had gone to bed at about 1900, and slept well until 2345 when he woke to start his watch at midnight.

In the event, stevedores worked slower than had been expected and, as a result, *Dole America*'s departure was delayed. The second officer called the third officer at 0100 to check the bridge equipment prior to departure and the vessel eventually left the berth at 0250 on 7 November.

The scheduled time of arrival at Antwerp had originally been 1800 but the combined delays meant she would no longer achieve this. The master believed he could reach Antwerp by 2100 but anything later would jeopardise the ability to meet the market deadlines.

1.2.3 Departure from Portsmouth (Figure 2)

While crossing the Atlantic the second officer had drawn up a draft plan for the passage from the Nab Tower to Antwerp. The master had seen this and had made a slight amendment. During the time *Dole America* was drifting prior to arrival at Portsmouth, the second officer had finalised his plan from where he expected the pilot would disembark to the west of the Nab Tower, to Antwerp. There was no discussion between the master and the second officer regarding this final version.

On sailing from Portsmouth, the bridge was manned by the pilot, master, chief officer and a helmsman. Both steering motors were running and the helmsman was temporarily relieved by another crew member during the passage out of harbour and while under pilotage. The second officer was stationed forward for the unberthing operation, was stood down at 0330, and arrived on the bridge at 0335, by which time the master had already sent the chief officer below to rest. Two ARPA radar sets and an electronic chart system with a GPS overlay were operational. Forward and aft draughts were 7.2m and 8.1m respectively.

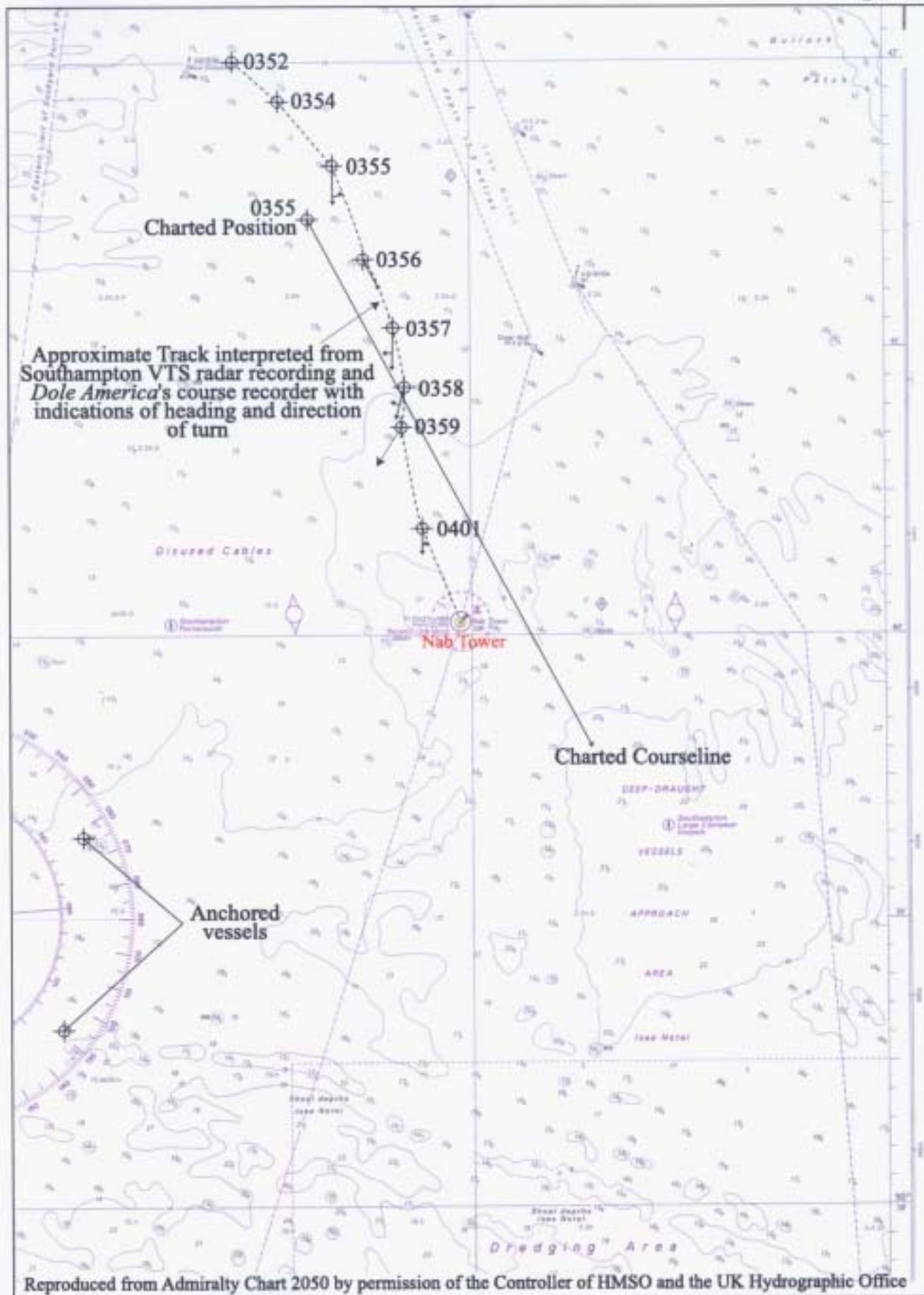
The master agreed with the pilot that the latter could leave the vessel in the vicinity of the New Grounds buoy. During the pilotage, the master noted that the charted passage plan started at the pilot boarding point to the west of the Nab Tower. Notwithstanding this he decided to change the plan so to pass between the Outer Nab buoy and the Nab Tower and join the planned track to the south-east of the tower. He informed the pilot and the second officer of his intentions.

While approaching the New Grounds buoy, the pilot reduced speed to dead slow ahead which gave him about 6 knots. After passing the buoy, he drew the master's attention to both the Outer Nab buoy and the Nab Tower both on radar and visually, and told him that the tide was setting south-easterly. He also asked the master to monitor VHF radio channel 9 until the pilot boat was clear. Before leaving the bridge, the pilot ordered a course of 145° to allow the vessel to pass safely between the Outer Nab buoy and the Nab Tower.

At 0352, the second officer escorted the pilot to the pilot ladder which had been rigged on the port side. The master ordered starboard helm to provide extra lee before going out to the port bridgework to see the pilot transfer safely to the pilot boat. He returned to the centre of the bridge and acquired the radar echoes of the Outer Nab buoy and the Nab Tower on the ARPA. The Nab Tower's racon was visible on the radar.

Before disembarking, the pilot had told the master that there were two inbound vessels; a ferry was expected to pass to the west of the Nab Tower, and another vessel was entering the deep water channel to the east of the tower. The master could see the echoes of both vessels on the radar, and those of two vessels in the anchorage to the south-west of the Nab. He could

Figure 2



also see the lights of the Outer Nab buoy and the Nab Tower visually. Although he held these contacts visually he chose to navigate by radar and noted that the range of the Nab Tower was 1.8 miles.

The second officer returned to the bridge at 0355 and plotted a position on the chart. By this time, *Dole America* was on half ahead and turning to port with 10° of port helm applied. It was the master's intention to turn the vessel into the deep water channel to seaward of the Outer Nab buoy. The second officer drew a track of 152° from the 0355 charted position to pass approximately 2 cables to the east of the Nab Tower.

The master was, meanwhile, standing by the port radar and saw what he interpreted to be a red light about 1 point on the starboard bow. The port radar was set on the 3-mile range scale, but he was unable to see anything on the radar, which correlated with the visual sighting. Reversing the wheel by ordering starboard helm he moved round to the front of the console to get a better view from the starboard forward window. The swing to port was arrested on a heading of about 160° before she started to turn to starboard. As *Dole America* began to swing to starboard, the master could still see the red light. It was now ahead.

The master ordered amidships helm, and then instructed the second officer to come forward with binoculars to confirm what he could see. The second officer went to the port forward window and said that he too could see a red light. He then saw what he thought was another red light to starboard and told the master that there were now two of them. By this time, the master could also see what he interpreted to be white flashing lights, which he considered were probably fishing vessels or other small yachts or boats. He ordered hard to starboard helm, and *Dole America* responded accordingly. She started to swing to starboard. When no further lights were seen ahead, he ordered hard to port helm.

The master could clearly see the flashing light of the Nab Tower, which he estimated to be at a range of between 5 and 6 cables. He remained at the forward window while the second officer returned to the chart table. The master intended to leave the Nab Tower to starboard and thought he would do so with ease. He chose to pass to the east rather than the west of it because he was conscious that time was critical for the passage to Antwerp.

The vessel reached a heading of about 220° before turning to port. The time was 0400.

At 0402, *Dole America* collided with the foundation of the Nab Tower, bounced off, and then struck it a second time before passing clear. She was making good a speed of about 9 knots at the time of impact, and sustained damage to the hull by Nos 2 and 3 holds, and aft between the main deck and the waterline.

1.2.4 Events following the collision

Immediately following impact the master ordered hard to starboard helm and a course of 270°. He informed Southampton VTS of the collision on VHF radio channel 12. The emergency signal was sounded and the crew started to assemble at the muster station on the poop deck. The master then received reports of high level bilge alarms in Nos 2 and 3 holds and realised the vessel was taking water. At 0410, the pilot, who had overheard the call to Southampton VTS, asked the master if he required assistance. The master confirmed that he

did, and the pilot boat returned at full speed. By this time, *Dole America* had developed a starboard list.

At 0414, the pilot relayed the situation to QHM Portsmouth, who then reported the accident to HM Coastguard MRSC Solent. The Bembridge RNLI lifeboat was tasked immediately.

The pilot advised the master to alter course to starboard into the deep water channel, and re-boarded the vessel 1 cable to the east of the New Grounds buoy at about 0430. The master told the pilot that the vessel had hit something and had developed a 12° starboard list. He added that he was concerned for the safety of his ship, her stability and the possibility of her foundering. The pilot boat crew had meanwhile reported a large gash in the hull aft through which they could see the engine room. The draught indicators were reading 12.2m forward and 7.9m aft. Hold bilge pumping had been started, and, as a precaution, the vessel's life-saving equipment had been prepared for immediate use.

With the agreement of the master, the pilot informed Southampton VTS and QHM Portsmouth that he would attempt to manoeuvre the vessel out of the main channel and put her aground.

At 0439, QHM declared emergency plan *Solfire A*, and the tug *Bustler* was despatched to the scene.

At 0500, the pilot ran *Dole America* aground on Horse Tail bank, approximately 2 cables to the north of the Dean Tail buoy, and then gave instructions for the port anchor to be dropped. The tug *Bustler* arrived on scene at 0530, made fast aft, and then manoeuvred *Dole America* on to a southerly heading.

Lloyd's Open Form was subsequently agreed with the tug *Anglian Duke*, which then made fast to the starboard bow of *Dole America*.

1.3 Environmental conditions

At the time of the accident, the wind was north-westerly at 5 to 10 knots, and the visibility was good. It was a dark night.

High water at Portsmouth was at 2226 on 6 November, and the predicted tide at the Nab was setting south-easterly at 0.4 knot.

1.4 Vessel certification

All statutory certificates were valid at the time of the accident.

1.5 Particulars of crew

There were 22 people on board *Dole America* at the time of the accident, including the master and three deck officers. The crew were drawn from Norway, India, the Philippines, Ecuador and Poland.

The 61 year old Norwegian master first went to sea in 1955, and held a Norwegian Deck Officer Class 1 Certificate of Competency which he obtained in 1969. He had served on board refrigerated cargo vessels since 1962, and was given his first command in 1972. He joined Dole Fresh Fruit International Ltd in 1978 and had served on board *Dole America* a number of times before the accident, including her maiden voyage. He had not called at Southampton or Portsmouth since one of his first trips to sea as an apprentice. The master had the conn at the time of the accident.

The 29 year old Indian chief officer held an Indian Class 1 Certificate of Competency. He had worked for Dole Fresh Fruit International Ltd since December 1998.

The 43 year old Filipino second officer first went to sea in 1978 as an ordinary seaman. He became a third officer in 1989 and held Filipino and Liberian second mate qualifications. He was employed by a crewing agency based in the Philippines and first worked on board *Dole America* as third officer in August 1998. He was promoted to second officer in November 1998, left the vessel the following June, and returned on 10 October. At the time of the accident the second officer was on the bridge as the officer of the watch.

The Filipino helmsman at the time of the accident was 22 years old. He had 8 months previous experience as a junior deck boy, before joining *Dole America* as an ordinary seaman in May 1999.

1.6 Extent of damage to *Dole America* (Figures 3, 4, 5 and 6)

The vessel was holed on the starboard side in three places. One hole was on the starboard quarter about 1m above the waterline, measuring approximately 8m long and 2m wide. The hole breached the engine room and ruptured a lubricating oil tank, causing 5,200 litres of lubricating oil to spill into the sea.

The other holes were below the waterline in the vicinity of the bilge keel at Nos 2 and 3 holds. One hole measured approximately 20m long and breached No 2 double bottom tank. The other breached No 3 hold and the double bottom tank below it, causing flooding of No 3 hold, and also of No 2 hold via a damaged transverse bulkhead between the holds.

1.7 Quality and safety management system

Dole Fresh Fruit International Ltd undertook an internal quality and safety management system audit on board *Dole America* on 1 June 1999. One of the recommendations to emerge from this audit was that passage plans should be more detailed. Specifically, it suggested that a more detailed passage plan be developed mentioning sailing directions, lists of lights, tide tables, pilot boarding grounds, whether the route is great circle or Mercator, and should clearly indicate no-go areas. No specific reference was made to the requirement to produce pilotage passage plans.

Bridge and pilot information departure checklists had been completed prior to leaving Portsmouth. The checklists formed part of the quality and safety management system. No specific entry was required to be made on either checklist with respect to confirming that a

General arrangement plan

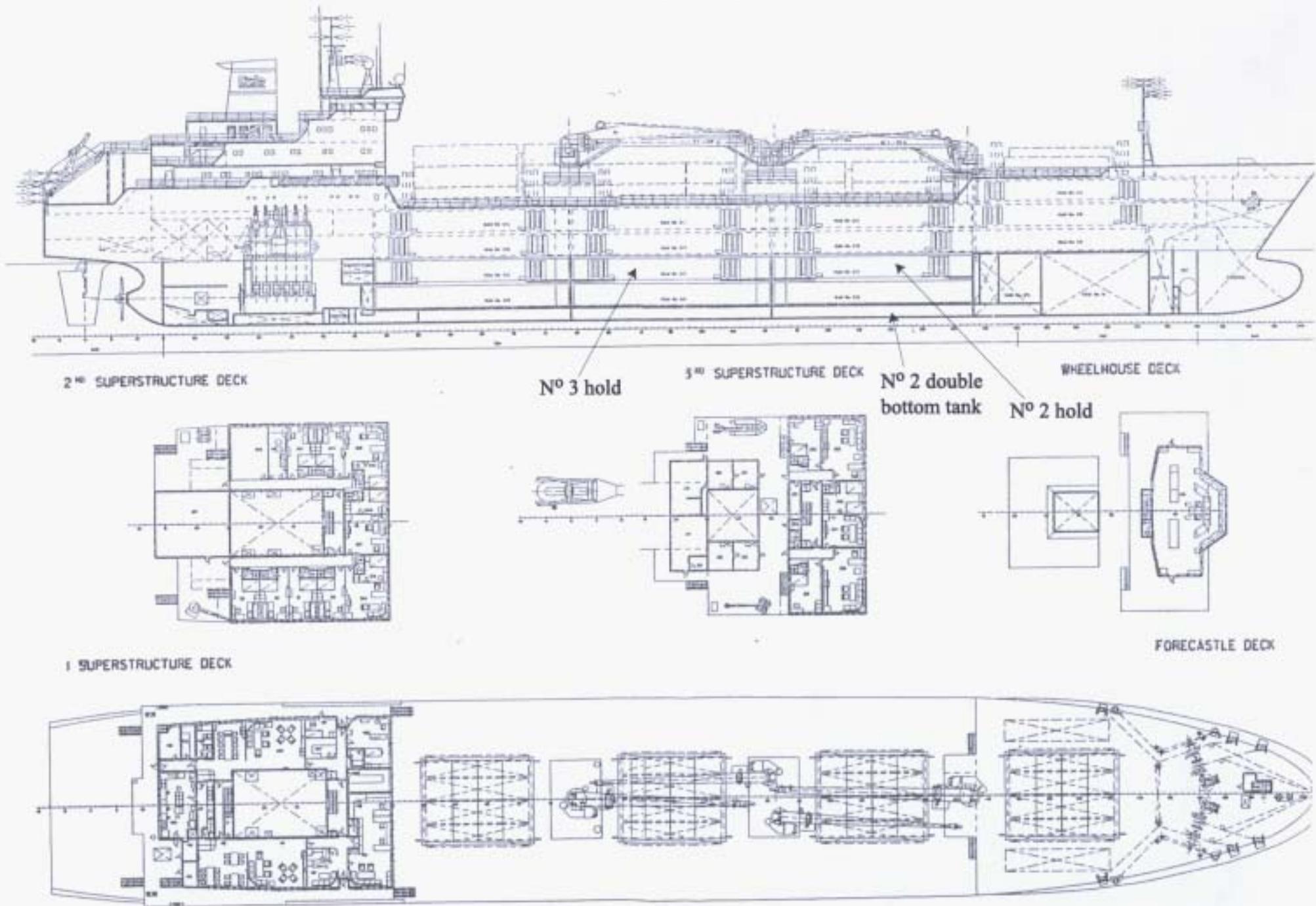


Figure 3

Figure 4



Figure 5



Figure 6



Extent of damage

pilotage passage plan had been formed and agreed between the master, his officers and the pilot.

The following are extracts from the *Quality and Safety Management System Manual* dated August 1997:

7.3.0-1 Safe Navigation

...The International Chamber of Shipping (ICS) "Bridge Procedures Guide" is to be fully consulted...

7.3.0-4 Observations

All deck officers must take an active part in the navigation of the vessel and shall take such observations as the Master requires...

7.3.0-5 Pilotage

...The Master and the Pilot shall exchange information regarding the complete transit. (see checklists)...

...Pilots shall be given every assistance which they may require...

7.3.0-13 Look-Out

Every ship shall at all times maintain a proper look-out by sight and hearing as well by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision, stranding and other hazards to navigation. Additionally, the duties of the look-out shall include the sighting of ships or aircraft in distress, shipwrecked persons, wrecks and debris. It is required that on one man bridge vessels, lookouts are to be posted / when arriving / departing port / restricted visibility and whenever else the Master finds it necessary.

In applying these principles, the following shall be observed:

- a) Whoever is keeping a look-out must be able to give full attention to that task and no duties shall be assigned or undertaken which would interfere with the keeping of a proper look-out;*
- b) The duties of the person on look-out and helmsman are separate and the helmsman should not be considered the person on look-out while steering, and;*
- c) There may be circumstances in which the Officer of the Watch can safely be the sole look-out in daylight. However, this practice shall only be followed after the situation has been carefully assessed on each occasion and it has been established without doubt that it is safe to do so. Full account shall be taken of all relevant factors including but not limited to the state of the weather, conditions of visibility, traffic density, proximity of navigational hazards and if navigating in or near a traffic separation scheme.*

d) *A look-out should always be posted during hours of darkness.*

7.3.0-15 Entering or Leaving Harbour during hours of darkness

As a general rule, in all harbours or ports where it is the practice for ships to enter or leave during dark hours, the Company expects the Masters to conform with this practice. The Master has, however, full discretion to delay entry or leaving if, by reason of adverse weather or other conditions, he considers it unsafe...

1.8 Bridge layout and equipment (Figures 7 and 8)

Dole America's bridge was spacious with good visibility ahead and to the sides. A shallow u-shaped central console contained all of the main bridge instruments and the two radars. A central steering console was positioned between two pedestal seats for use by watchkeepers.

Immediately forward of the console and set into the deckhead at an angle was an instrument panel showing a clock, rudder indicator and other instruments which could be clearly seen from behind the central console.

The console was set back from the forward sloping bridge windows with a walkway between them. Anyone standing in front of the console would be unable to see any of the displays on the console or the deckhead instruments.

A course recorder was fitted, was functioning correctly and has been used to reconstruct many of the essential features of the events leading up to the collision. *Dole America* was in hand steering at the time of the accident.

1.9 Bridge Procedures Guide

The following are extracts from the International Chamber of Shipping's *Bridge Procedures Guide* third edition dated 1998:

Introduction

Motivation

Motivation comes from within and cannot be imposed. It is however the responsibility of the master to create the conditions in which motivation is encouraged.

A valuable asset in any organisation is teamwork and this is enhanced by recognising the strengths, limitations and competence of the people within a team, and organising the work of the bridge team to take best advantage of the attributes of each team member.

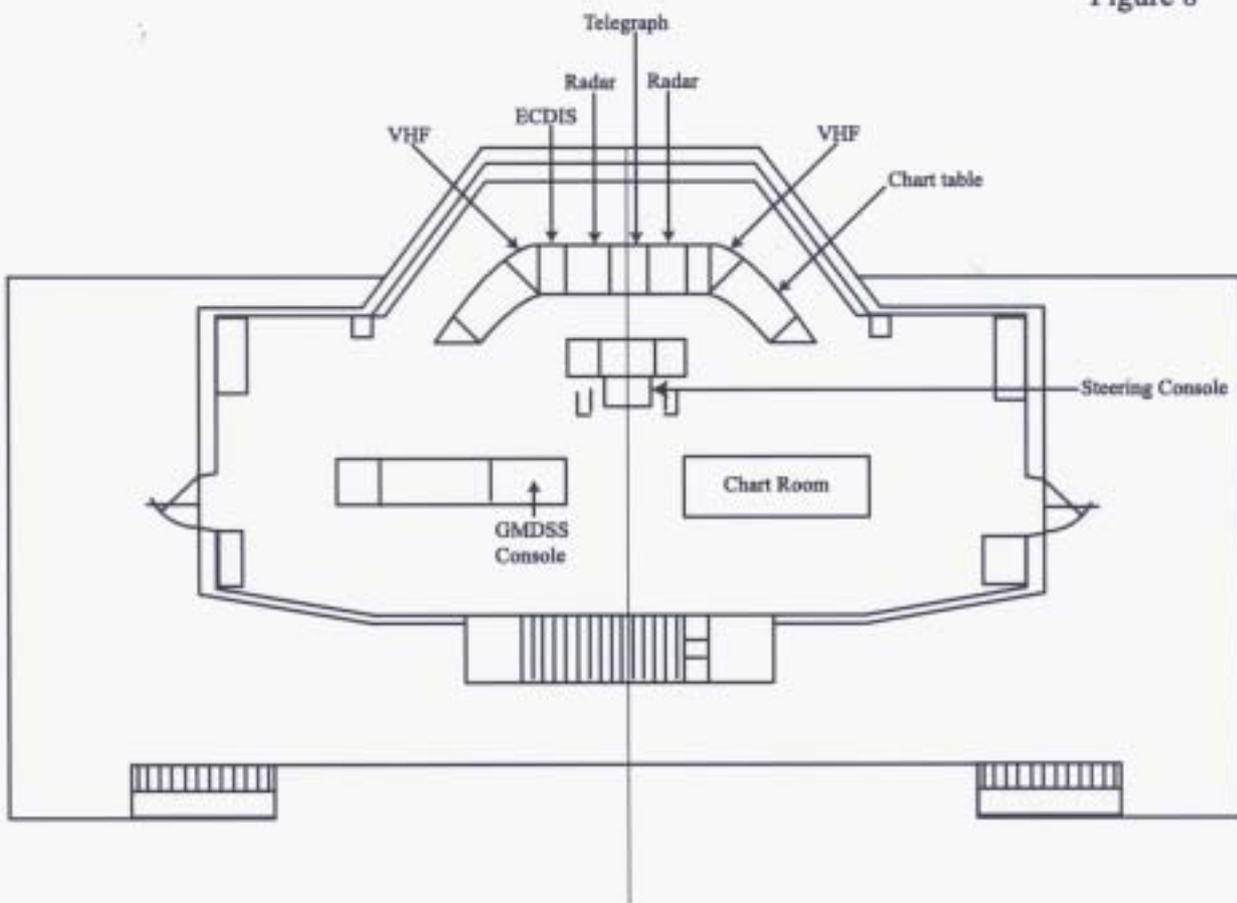
Working in isolation when carrying out critical operations carries the risk of an error going undetected. Working together and sharing information in a professional way enhances the bridge team and the master/pilot relationship. Training in bridge resource management can further support this.

Figure 7



Bridge layout

Figure 8



Bridge plan

1 Bridge organisation

1.1 Overview

General principles of safe manning should be used to establish the levels of manning that are appropriate to any ship.

At all times, ships need to be navigated safely in compliance with the COLREGS and also to ensure that protection of the marine environment is not compromised.

An effective bridge organisation should efficiently manage all the resources that are available to the bridge and promote good communication and teamwork.

The need to maintain a proper look-out should determine the basic composition of the navigational watch. There are, however, a number of circumstances and conditions that could influence at any time the actual watchkeeping arrangements and bridge manning levels.

Effective bridge resource and team management should eliminate the risk that an error on the part of one person could result in a dangerous situation.

The bridge organisation should be properly supported by a clear navigation policy incorporating shipboard operational procedures, in accordance with the ship's safety management system as required by the ISM Code.

2 Passage planning

2.1 Overview

Passage planning is necessary to support the bridge team and ensure that the ship can be navigated safely between ports from berth to berth. The passage plan should cover ocean, coastal and pilotage waters.

The plan may need to be changed during the voyage; for example, the destination port may not have been known or may alter, or it may be necessary to amend the plan following consultation with the pilot.

If the plan is changed during the voyage, the bridge team on each watch should be consulted and briefed to ensure that the revised plan is understood.

The passage plan should aim to establish the most favourable route while maintaining appropriate margins of safety and safe passing distances offshore...

...The intended voyage should be planned prior to departure using appropriate and available corrected charts and publications. The master should check that the tracks laid down are safe...

...In addition, the duty of the master to exercise professional judgement in the light of changing circumstances remains a basic requirement for safe navigation.

1.10 Fatigue

The following are extracts from the Transportation Safety Board of Canada's *A Guide for Investigating for Fatigue* dated August 1997:

Effects of Fatigue on Performance

- *Fatigue affects the ability to judge distance, speed, and time.*
- *When alertness is impaired, people may fix their focus on a minor problem, when there is a risk of a major one; may fail to appreciate the gravity of a problem or situation; may display flawed logic; and may apply inappropriate corrective actions.*

Performance Impairment *Problem-solving Ability*

Indicators

Displayed flawed logic
Displayed problems with arithmetic, geometric or other cognitive processing tasks
Applied inappropriate corrective action
Did not accurately interpret situation
Displayed poor judgement of distance, speed, and/or time.

1.11 The Nab Tower

The Nab Tower is a conspicuous man-made construction in position 50° 40'N, 000° 57'W and some 4.5 miles to the east of the Isle of Wight. Its origin can be traced back to the final year of the first world war when the Admiralty became extremely concerned by the number of attacks U-boats were making on British shipping and decided to take drastic action by constructing eight fort-like structures that would support a chain of anti-submarine nets across the Channel.

Work started on building two of them at Shoreham in Sussex, but the end of the war intervened and only one was completed. After much thought it was decided to use it as a replacement for the existing Nab light vessel that marked the eastern end of the Spithead approaches.

The new construction was towed from where it was built to its present position and sunk by flooding the base. It eventually settled with a very slight list, which is evident to this day. It became an offshore lighthouse in 1920 and was automated in 1983. It is 27m high, 12m in diameter and consists of a latticed steel construction surrounding a cylindrical steel tower. It is built on a hollow 24m concrete base.

At the time of the accident the Fl (2) 10s light was functioning correctly.

Dole America is the first vessel of any significant size to have hit it. The tower sustained some damage at its base but the light remained unaffected.

SECTION 2 - ANALYSIS

2.1 Introduction

This analysis is based on events leading up to, and following, the collision of *Dole America* with the Nab Tower, and covers the period until the vessel was purposely run aground on Horse Tail bank and held in a position of relative safety.

The MAIB is grateful for the Liberian administration's co-operation during its investigation of the accident. Access to key witnesses and other evidence on board *Dole America* was delayed due to both the MAIB and Liberian appointed inspectors being denied access to the vessel during salvage operations following the accident.

The fundamental purpose of this analysis is to determine the circumstances and causes of the accident with the aim of improving the safety of life at sea and the avoidance of similar accidents in the future.

2.2 Bridge manning

The factors to be taken into account when determining the level of bridge manning required for safe navigation include the vessel's size, manoeuvring characteristics, equipment, bridge layout, and the environment.

The operator's *Quality and Safety Management System Manual* requires a lookout to be posted at night. It further requires the lookout to be separate from the helmsman, and for him to be able to give full attention to that task.

A dedicated lookout was not posted during *Dole America*'s departure from Portsmouth. Although the bridge was manned initially by four people, each had other duties assigned to him; the helmsman was steering the vessel, the chief officer was navigating, the pilot was conning, and the master was in overall command. The duties of the pilot, master and chief officer to some extent involved each of them keeping a lookout. However, there was no guarantee that at any one time a proper lookout was being maintained.

The situation became less satisfactory when the master sent the chief officer below to rest. The master then found he was handling the additional task of navigating until the second officer arrived on the bridge. The situation further deteriorated when the second officer escorted the pilot to the pilot ladder; leaving the master to conn the vessel, navigate and maintain a lookout alone.

When the master later sought confirmation of the red light he had seen, he called the second officer to the forward window. Had he been able to call on a dedicated lookout instead, the second officer would have been able to continue navigating without interruption, and would have been ideally placed to advise the master against his decision to alter course to port to pass to the east of the Nab Tower.

It was normal practice for the pilot to disembark in the vicinity of the New Grounds buoy, and he did so with the agreement of the master. Although the vessel was not in particularly confined waters at that stage, she was not yet clear of the approaches to The Solent and, as

such, the bridge required an appropriate level of manning to eliminate the risk that an error by any one person could lead to a dangerous situation.

The principles of safe bridge manning are set out in the International Chamber of Shipping's *Bridge Procedures Guide*, which is referred to in the operator's *Quality and Safety Management System Manual*. However, with the exception of requiring a lookout, the operator provides no instructions to its masters on specific minimum levels of bridge manning. Such instructions would leave the master in no doubt about the minimum resource the operator required him to use, and would strengthen any decision by him to delay port entry or departure on safety grounds should he judge key personnel to be insufficiently rested. In this regard, section 7.3.0-15 of the operator's *Quality and Safety Management System Manual* could be enhanced to instruct its masters to exercise full discretion to delay departure at any time without fear of retribution.

2.3 Bridge teamwork

A comprehensive passage plan, agreed by all parties at the outset, is a sound basis for effective bridge teamwork, which is necessary to eliminate the risk that an error by one person could result in a dangerous situation.

With respect to pilotage, the *Quality and Safety Management System Manual* requires the master to exchange information with the pilot regarding the complete transit, and makes reference to the checklists provided. However, the checklists make no reference to the pilotage passage plan being agreed between the master, his officers and the pilot before departure.

No plan had been formed for the passage from the berth to the pilot boarding point. The master was aware that the passage plan started at the pilot boarding point but was unaware, prior to departure that the pilot might consider disembarking at the New Grounds buoy. He was keen not to delay the vessel further, and took the opportunity of changing the plan to reduce the passage distance and avoid passing to the west of the Nab Tower. The time saved by this last minute change of plan was less than five minutes and probably only two or three.

Had a pilotage passage plan been formed and discussed with the pilot prior to departure, the master would have been aware at the outset that the pilot might consider disembarking at the New Grounds buoy. The plan could then have been revised before departure, rather than at a time when the vessel was still in the approaches to The Solent with no pilot on board, no dedicated lookout posted, and a deck officer who had just returned to the bridge and needed time to fully appraise himself of the situation.

The lack of a pre-determined pilotage passage plan was a contributory factor to the accident. Its absence led to an unnecessary distraction at a point when neither the master nor the second officer had sufficient time to fully appraise themselves of the changed situation, particularly as the vessel had not called at Portsmouth before, and the master was unfamiliar with the area.

No discussion took place between the master and the second officer concerning the revised plan or the vessel's progress. The second officer simply carried out the master's instructions.

The only information that he appears to have offered was the fact that he could see what he interpreted to be a second red light to starboard of the first.

He made this observation very shortly after returning to a darkened bridge from seeing the pilot disembark. As it takes a significant time for the eyes to adapt to the dark, the reliability of his night vision in such a short timescale is questionable.

The second officer made no comment as to what or how far away he thought the lights were, and made no attempt to establish their positions. Subsequently, he did not question the master's hard to port helm order.

The operator's *Quality and Safety Management System Manual* requires all deck officers to take an active part in the navigation of the vessel, but relies on the master to determine how the requirement is put into effect. Advice is provided in the International Chamber of Shipping's *Bridge Procedure Guide*, which emphasises the danger of working in isolation, and points to the master to create the conditions in which motivation for teamwork is encouraged. Additionally, the guide recognises the advantages of training in bridge resource management and teamwork, and the need for operators to provide proper support in the form of a clear navigation policy.

In this instance the master was Norwegian and the second officer Filipino. It is probable that the differing nationalities and the social backgrounds of the master and second officer were factors in their failure to work as an effective team.

With respect to navigation, the *Quality and Safety Management System Manual* requires deck officers to take such observations as the master requires, and to give every assistance required by the pilot. However, the operator provides no specific instructions to its deck officers regarding voluntarily offering relevant information to the master and pilot.

Such instructions would, if introduced, encourage the development of good communications and effective bridge teamwork.

2.4 Bridge layout

When he saw what he interpreted to be a red light about 1 point on the starboard bow, the master felt it necessary to move to the front of the bridge to check what he thought he had seen. This suggests he thought the light might have been a reflection from the bridge instrumentation on the forward sloping bridge window, or that he might have imagined it and wanted to confirm his interpretation from another perspective. Whatever the reason, his action meant that he was no longer able to readily monitor the bridge instrumentation from where he now stood, and was reliant on the second officer to do so.

The master then aggravated the situation by calling for the second officer to join him at the front of the bridge. In so doing he removed his only source of navigational information apart from what the helmsman could tell him about the ship's head and the amount of rudder applied.

The master's decision to order hard to port helm was based solely on his visual estimation of the direction and range of the Nab Tower. He neither requested, nor was offered, any advice from the second officer.

Although the master's inability to monitor the bridge instrumentation from the forward window was a direct result of the bridge layout, an increased level of bridge manning, good communications and effective teamwork would have ensured he was kept fully apprised of the situation.

2.5 Perception

The source of the interpreted red and flashing white lights has not been determined. It is possible they were either imagined or the result of a sight defect. However, at least one red light was apparently seen by both the master and the second officer, and therefore is assumed to have been present.

The master was concerned about the red light he thought he had seen because he was unable to correlate it with any echo detected on the port radar set on the 3-mile range scale. It was, in his opinion, the light of a fishing vessel, a small yacht or a boat at close range. As such, he recognised that if a risk of collision existed, his was the give-way vessel in accordance with the *International Regulations for Preventing Collisions at Sea*. He considered that he had no time to check if a risk of collision existed, and assumed without hesitation that it did. He ordered starboard helm, and then went forward to confirm what he thought he could see. He then asked the second officer to do likewise.

The master acted with good intention in taking action to avoid a collision with a crossing vessel at close range. He genuinely thought he had a close quarters situation with an unknown, and unidentified, vessel and decided to take immediate action to avoid it.

An attempt has been made to identify or explain the source of the lights. It is possible they came from a vessel, or vessels, at long range which would account for the difficulty he had in identifying them. His impression that the vessel was at close range could have been because the red light appeared significantly lower than the Nab Tower light, which has an elevation of 27m. Had the master increased the radar range scale when he initially saw the red light, he might have been able to correlate an echo with what he had seen.

Another possibility is that the red lights were from one or both of the vessels at anchor to the south-west of the Nab Tower. The anchored vessels were significantly further to starboard than the direction in which the first red light was apparently seen. However, the second red light and the interpreted flashing white lights may well have been from the anchored vessels.

2.6 The collision

After altering course to starboard for the red light, the master's decision to turn to port to pass to the east of the Nab Tower was flawed.

With no direct means of determining the heading of his vessel and the relative position of the Nab Tower other than by visual estimation, the master ordered hard to port helm under the

mistaken impression that she would pass to the east of the tower with ease. In making his decision, he was unaware of the vessel's heading and her exact position in relation to the Nab Tower. He also failed to take full account of the advance and transfer of his intended actions, given that the helm was hard to starboard and *Dole America* was swinging to starboard at the time of his order.

His decision to come to port was also probably influenced by his revised plan to pass to the east of the tower, and the commercial advantage in terms of reduced passage distance to Antwerp, underpinning that intention.

The evidence suggests that an autocratic management style was in place, such that the second officer was reluctant to offer information to the master, and the master was reluctant to request it. Although an autocratic management style may be a short-term solution to cultural barriers in attempting to operate the vessel efficiently, this accident has highlighted the need for a long-term solution in the form of good communications and teamwork, through education and training. The potential problem could be reduced by having a bridge team drawn from a single nationality.

The master's perception and decision-making abilities may have been affected by fatigue and stress, but to what degree is uncertain. The Transportation Safety Board of Canada's *A Guide for Investigating for Fatigue* supports this suggestion. The master had not slept well during the Atlantic crossing and he had been unnecessarily disturbed during the evening alongside. If he had felt unduly tired and unfit for duty before leaving Portsmouth, the master was in a position to delay departure. He chose not to do so. A less autocratic management style on board would have enabled mundane work, such as presenting a health declaration and other papers to officials, to be delegated to other personnel so as not to unduly disrupt periods of rest.

With regard to possible stress, the master had been concerned for the well-being of his vessel and her cargo during the Atlantic crossing, and was now aware that any further delay in the passage to Antwerp would jeopardise the ability to meet the market deadlines. His decision to pass to the east of the Nab Tower took precedence over the more seamanlike approach which would have been to continue turning to starboard and pass to the west of it. The extra time required to do so would have been in the order of two to three minutes.

2.7 Events following the collision

Very shortly after the collision it became apparent that *Dole America* was holed and taking water. Had no action been taken she would almost certainly have foundered.

Personnel on board, and those ashore and on assisting vessels, worked effectively to resolve the immediate emergency and place the vessel in a position of relative safety.

The master and the pilot both agreed that the only viable course of action open to them was to deliberately run the vessel aground in shallow water away from the main shipping lane. The pilot decided that his best choice was to run the vessel aground on Horse Tail bank, two cables to the north of the Dean Tail buoy. This action saved the vessel from foundering.

SECTION 3 - CONCLUSIONS

3.1 Immediate cause

The immediate cause of the collision was the master's inappropriate and unquestioned helm order to port.

3.2 Contributory causes and underlying factors

1. In making his decision to order hard to port helm, the master was unaware of the vessel's heading and her exact position in relation to Nab Tower. He also failed to take fully into account the time it would take for the vessel to turn, given that the helm was hard to starboard and the vessel was swinging to starboard at the time of his order. [2.6]
 - (i) The master was unable to monitor the bridge instrumentation from the forward window. [2.4]
 - (ii) The master felt it necessary to move to the forward window to confirm what he thought was a red light. [2.5]
 - (iii) The planned route was revised at a point when neither the master nor the second officer had sufficient time to fully appraise themselves of the changed situation. [2.3]
 - (iv) The lack of a pre-determined pilotage passage plan caused an unnecessary distraction at a time when the vessel was still in the approach to The Solent with no pilot on board, no dedicated lookout posted, and a deck officer who had just returned to the bridge and needed time to fully appraise himself of the situation. [2.3]
 - (v) *Dole America* had not called at Portsmouth before, and the master was unfamiliar with the area. [2.3]
 - (vi) Although the operator's *Quality and Safety Management System Manual* requires the master to exchange with the pilot information regarding the complete transit, the checklists make no reference to the pilotage passage plan being agreed between the master, his officers and the pilot prior to departure. [2.3]
 - (vii) No discussions took place between the master and the second officer concerning the revised plan or the vessel's progress. [2.3]
 - (viii) The master and the second officer failed to work as an effective team, probably due, in part, to their differing nationality and social background, and to an autocratic management style. [2.3]
 - (ix) With no dedicated lookout to refer to, the master called the second officer to join him at the forward window to confirm what he thought was a red light,

thereby removing his only source of navigational information, with the exception of the helmsman. [2.4]

- (x) With the exception of requiring a lookout, the operator provides no instructions on specific levels of bridge manning. [2.2]
 - (xi) The operator provides no specific instructions to its deck officers regarding voluntarily offering relevant information to the master and pilot. [2.3]
2. The master wanted to pass to the east of Nab Tower. [2.3]
- (i) The master was probably influenced by his revised plan to pass to the east of the tower. [2.6]
 - (ii) With the pilot disembarking at New Grounds buoy, the master took the opportunity of reducing the passage distance for commercial reasons. [2.6]
 - (iii) Adverse weather and a prolonged port call had put *Dole America* behind schedule, and the master was keen not to delay the vessel further. [2.3]
3. The master altered course to starboard for what he considered to be a crossing vessel at close range on his starboard bow. [2.5]
- (i) The master recognised that if a risk of collision existed, his was the give-way vessel in accordance with the *International Regulations for Preventing Collisions at Sea*. [2.5]
 - (ii) The master was probably mistaken. It is possible that the lights were from a vessel or vessels at some distance out to sea, or from one or both of the vessels at anchor to the south-west of Nab Tower. [2.5]
 - (iii) The second officer confirmed what he interpreted to be a red light and a second red light to starboard of the first one, but made no attempt to establish their positions. [2.3]
4. Fatigue and stress may have adversely affected the master's perception and decision-making abilities. [2.6]
- (i) The master had not slept well during the Atlantic crossing and he had been unnecessarily disturbed during the evening alongside. [2.6]
 - (ii) The master had been concerned for the well-being of his vessel and her cargo during the Atlantic crossing, and was now aware that any further delay in the passage to Antwerp would jeopardise the ability to meet the market deadlines. [2.6]

3.3 Other findings

- 3.3.1 All statutory certificates were valid at the time of the accident. [1.4]
- 3.3.2 At the time of the accident, the wind was north-westerly at 5 to 10 knots, the visibility was good. It was a dark night. [1.3]
- 3.3.3 The Nab Tower Fl (2) 10s light was functioning correctly. [1.11]
- 3.3.4 The master had the conn at the time of the accident. [1.5]
- 3.3.5 The second officer was on the bridge as the officer of the watch. [1.5]
- 3.3.6 In the minutes preceding the collision, the master could see the Nab Tower light. [1.2.3]
- 3.3.7 The collision occurred at 0402 UTC on 7 November 1999. [1.2.3]
- 3.3.8 *Dole America* was in hand steering at the time of the accident. [1.8]
- 3.3.9 *Dole America* was proceeding at about 9 knots at the time she collided with the Nab Tower. [1.2.3]
- 3.3.10 As a result of the collision, *Dole America* was holed in three places above and below waterline. [1.6]
- 3.3.11 Personnel on board *Dole America*, and those ashore and on assisting vessels, worked effectively to resolve the immediate emergency and place the vessel in a position of relative safety. This action saved the vessel from foundering. [2.7]
- 3.3.12 5,200 litres of lubricating oil were spilt into the sea. [1.6]

SECTION 4 - RECOMMENDATIONS

Reefership Marine Services (Dole Fresh Fruit International Ltd) is recommended to:

1. Review its quality and safety management system checklists with a view to ensuring that a pilotage passage plan is agreed between the master, his officers and the pilot prior to departure from the berth or pilot boarding point.
2. Provide instructions to its masters on specific levels of bridge manning, and to exercise full discretion to delay departure on safety grounds, without fear of retribution, should they judge key personnel to be insufficiently rested.
3. Provide specific instructions to its deck officers to provide relevant information to the master and pilot.
4. Provide bridge resource management and teamwork training for its masters, deck officers and bridge watchkeeping ratings.
5. Consider the potential effect on bridge teamwork when appointing multi-national groups of masters, deck officers and bridge watchkeeping ratings to a particular vessel.

**Marine Accident Investigation Branch
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