Report on the investigation of

the grounding of the

Italian registered chemical tanker

Attilio Ievoli

on Lymington Banks in the west Solent,

South Coast of England

3 June 2004

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Report No 2/2005
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Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999 – Regulation 4:

"The fundamental purpose of investigating an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 1999 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."

NOTE

This report is not written with liability in mind and is not intended to be used in court for the purpose of litigation. It endeavours to identify and analyse the relevant safety issues pertaining to the specific accident, and to make recommendations aimed at preventing similar accidents in the future.

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

ABP	-	Associated British Ports
ARPA	-	Automatic Radar Plotting Aid
CDI	-	Chemical Distribution Institute
EBL	-	Electronic bearing line
ECS	-	Electronic chart system
GPS	-	Global positioning system
HW	-	High Water
ICS	-	International Chamber of Shipping
IMO	-	International Maritime Organization
INS	-	Integrated Navigation System
ISM	-	International Safety Management Code
Kts	-	Knots (one nautical mile per hour)
LW	-	Low Water
m	-	metre
MHWS	-	Mean High Water Springs
MLWS	-	Mean Low Water Springs
mm	-	millimetre
OOW	-	Officer of the watch
RINA	-	Registro Italiano Navale
SMC	-	Safety Management Certificate
SOSREP	-	Secretary of State’s Representative for Salvage and Pollution
STCW 95 Code	-	Standards of Training Certification and Watchkeeping 1995
UKHO	-	United Kingdom Hydrographic Office
UMS	-	Unmanned machinery space
UNCLOS	-	United Nations Convention on the Law of the Sea
UTC	-	Universal Co-ordinated Time
VTS	-	Vessel traffic services

SYNOPSIS

At approximately 1632 (UTC +1) on 3 June 2004, the Italian registered, double hulled chemical tanker *Attilio Ievoli* ran aground on Lymington Banks in the west Solent. The vessel suffered bottom plate indentation forward but no hull penetration. Nobody on board was injured and there was no pollution.

Having completed loading a cargo of toluene and styrene monomer at No 9 berth, Fawley Marine Terminal, Southampton, UK, a pilot was ordered, and the vessel sailed at 1515. The master had decided to proceed to the English Channel via the west Solent and Needles Channel, as he had done on a previous occasion 6 weeks before. This decision was contrary to his company's standing instructions that required its vessels to use the east Solent route when arriving or sailing from Southampton.

The pilot disembarked at the East Lepe Buoy, automatic steering was engaged and the vessel continued her passage through the west Solent with the master conning from his forward console chair at the starboard radar. It was a clear day, with little recreational craft traffic and no other commercial traffic in the west Solent. Neither the second officer nor the cadet were sure of who was responsible for plotting positions on the chart, although both did some rudimentary checking off of buoys passed. The master was not paying attention to the navigation of the vessel, and was distracted, using the ship's mobile telephone.

Attilio Ievoli ran aground on Lymington Banks at about 1632, at a speed of about 11 knots. At this point she was approximately 0.5 mile north of her intended track.

Poor bridge team management on the vessel resulted in a lack of accurate vessel positional awareness and an inappropriate division of tasks. The use of the mobile telephone distracted the master from his primary responsibilities.

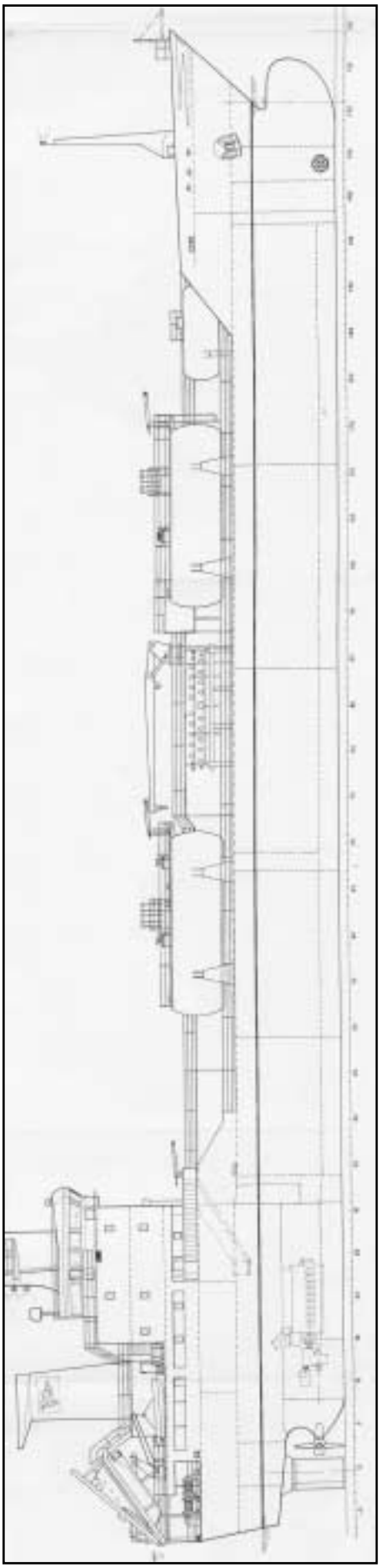
The routine transit of large vessels, some carrying hazardous cargoes and some carrying large numbers of passengers through the west Solent and Needles Channel, is a cause for concern. The route passes through an environmentally sensitive area but the navigable channel is narrow, survey of the channel is not performed frequently given the shifting shingle of the seabed, there is no pilotage available and the area is not monitored by any local Vessel Traffic System.

A recommendation has been made to the Department for Transport to ensure the establishment of traffic control measures for all commercial vessels of 500gt or more using the west Solent and Needles Channel. Recommendations have also been made to Trinity House, the International Chamber of Shipping and the owners of *Attilio Ievoli.*

Figure 1a

Attilio Ievoli

Figure 1b



Attilio Ievoli - Profile

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *ATTILIO IEVOLI* AND ACCIDENT (Figure 1)

Vessel details

Registered owner	:	Marnavi S.p.A.
Manager(s)	:	Marnavi
Port of registry	:	Naples
Flag	:	Italy
Type	:	Chemical tanker, IMO Type II
Built	:	1995 at Ancona, Italy
Classification society	:	Registro Italiano Navale and Bureau Veritas (dual classification)
Construction	:	Steel
Length overall	:	115.5m
As loaded draft	:	6.5m aft
Gross tonnage	:	4450
Engine type	:	Oil engine geared drive to a single screw
Service speed	:	14 knots
Other relevant info	:	Bow thruster, controllable pitch propeller

Accident details

Time and date	:	1632 (UTC +1), 3 June 2004
Location of accident	:	Lymington Banks, west Solent 50°43.'5N 001°30.'7W
Persons on board	:	16
Injuries/fatalities	:	None
Damage	:	1 metre square indentation, approximately 4 metres inboard from the forward end of the port side bilge keel. Extensive scoring of the bottom paintwork.

1.2 BACKGROUND

Built in 1995, the oil/chemical tanker *Attilio Ievoli* was one of 36 vessels owned and operated by the Italian company Marnavi S.p.A. She was registered in Italy, and was manned by 16 crew of various nationalities.

In May 2004, the Chemical Distribution Institute (CDI) carried out an inspection of the vessel during which four areas of concern with respect to bridge operations were highlighted.

The vessel, with the same master in command, had visited Southampton 6 weeks before the accident.

1.3 NARRATIVE

(All courses are true, and all times are UTC+1)

Attilio Ievoli left Antwerp on 28 May 2004 for Rotterdam, then onward to Southampton. She arrived via the eastern Solent and anchored at 0645 on the morning of 2 June to await a berth at Fawley Marine Terminal. At 1525, the anchor was aweigh; the pilot boarded the vessel at 1540 and the vessel berthed at Fawley at 1730.

At 1805, a Fawley Terminal safety officer and a cargo surveyor boarded the vessel. At 2000, inspections of the vessel and cargo were completed and loading of a cargo of toluene and styrene monomer began. This continued overnight, under the control of the chief officer, and was completed by 1235 the following day. By 1415, pre-departure documentation had been completed and pre-sailing checks of the bridge gear had been carried out.

The pilot boarded the vessel at 1445, and discussed the plan for departure with the master. The pilot was expecting *Attilio Ievoli* to depart via the east Solent, however, the master advised him that he planned to use the shorter, west Solent route, the next port being Barcelona. At 1500, the engines were brought to stand-by and the un-mooring process started. At 1515, the vessel was clear of the berth. The pilot, master, second officer, cadet and chief engineer officer were on the bridge. The pilot was conning the vessel, the master was in command, the second officer was keeping a check on position on the chart and the cadet was steering. The master was sitting in the starboard chair at the integrated conning console. His view ahead was impaired by the navigation console in front of him, which necessitated the chair being in its highest position. The chief engineer played no part in the bridge team as he was monitoring the UMS alarms from the port side of the forward integrated conning console **(Figure 2)**. With the chief engineer sitting at the port conning console, the port radar was not available for use by the bridge team, so ranges required for the position fixes were obtained from the starboard radar. This necessitated leaning across the master to reach the controls of the radar.

Figure 2

Conning position

Just before the pilot was due to disembark *Attilio Ievoli,* he received a message from the pilot boat that a flag was flying very close to the vessel's radar scanner. He passed the message to the master, who instructed the second officer to move the flag. The cadet was instructed to escort the pilot to the pilot ladder, and the steering was changed over to the autopilot. The pilot disembarked *Attilio Ievoli* at the western boarding point, south of the East Lepe Buoy **(Figure 3)**. The master continued to con the vessel from his seat behind the starboard radar.

After moving the flag, the second officer returned to the bridge and fixed a position on the chart at 1600. The cadet returned to the bridge and stood by the steering section of the console, monitoring the autopilot. Shortly afterwards, the master instructed the second officer to take down the pilot flag. The second officer fixed another position on the chart at 1610, as the vessel was abeam of the West Lepe buoy. He remembered this to be 2.1 cables off the buoy. He informed the master that the vessel was to the north of the planned track, and then went outside to the back of the bridge to take the pilot flag down. The master did not hear this report. The cadet also plotted a position at 1610, which placed *Attilio Ievoli* on track. The second officer's 1610 position was rubbed off the chart, possibly because it was mistaken for a position plotted during the vessel's last visit.

On his return to the bridge, the second officer looked at the chart and mentioned to the cadet that he thought the 1610 position was incorrect. A position at 1618 was also plotted on the chart in use, placing the vessel on track, but no-one

remembers who plotted this. At 1631, on passing Yarmouth, the master reported his position to Southampton VTS **(Figure 4)**. Shortly afterwards, *Attilio Ievoli* started to vibrate, and her engine began to labour. The chief engineer left the bridge to go to the engine room, and the master noted that Hurst Point Castle was on his port bow. He changed the automatic steering to manual and put the helm to port, but this had no effect as the vessel was already aground on Lymington Banks, approximately 0.5 mile north of the planned track.

Evidence from mobile telephone records shows that calls were made from *Attilio Ievoli*'s mobile telephone in the minutes leading up to the accident as follows:

Time	**Duration** **Minutes: seconds**
1600	11:33
1615	1:10
1618	3:59
1631	2:37
1636	6:21

The vessel's mobile telephone was kept on the bridge and calls were made from there.

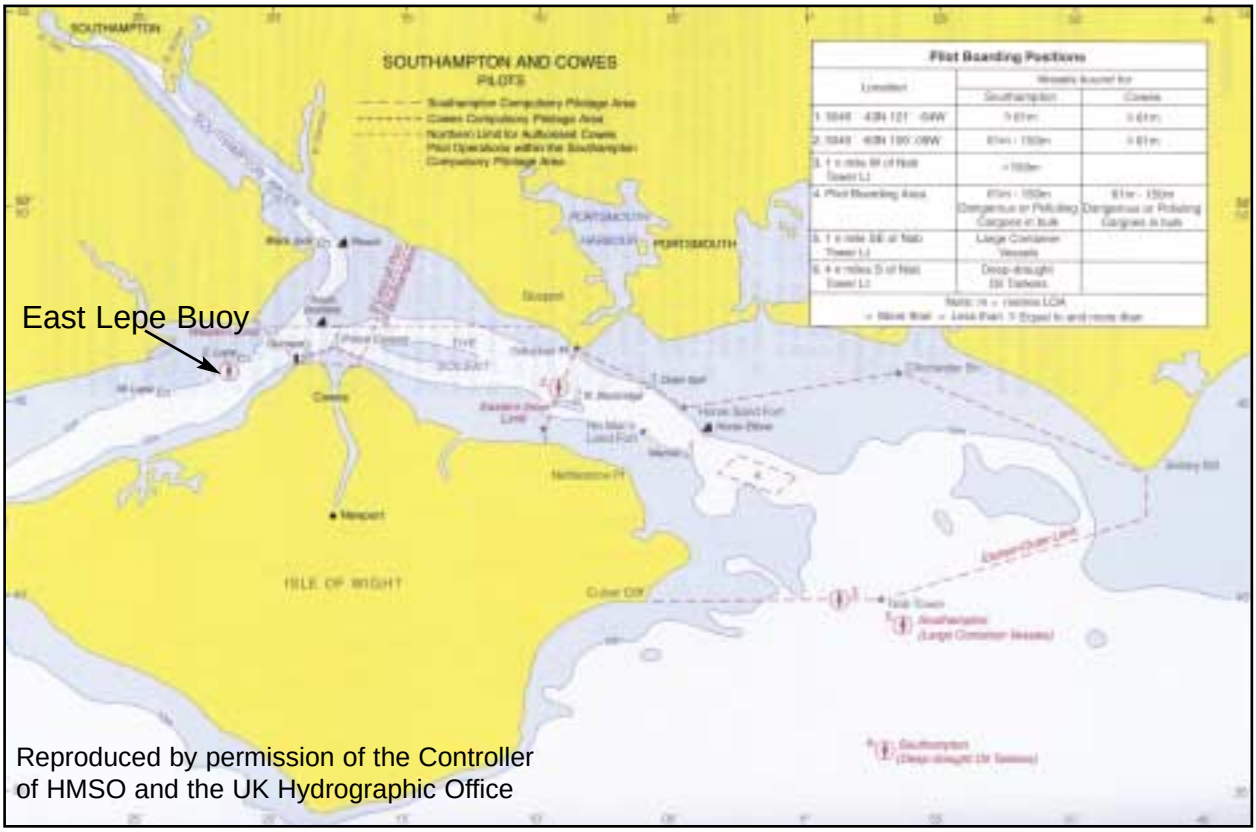
At 1635, a yacht which was passing Lymington, called Southampton VTS to report the "gas tanker" *Attilio Ievoli* apparently aground, going full astern, with her rudder hard-to-port and with her bow thruster running. Southampton VTS acknowledged this call. At 1637, VTS informed Solent Coastguard, and the coastguard emergency action plans were activated. Attempts by the coastguard to contact *Attilio Ievoli* by VHF radio were unsuccessful until 1720.

At this time, the coastguard was informed that the ship's staff had checked the vessel's hull integrity. They had found no water ingress and no evidence of cargo leaking out of the vessel. The coastguard informed SOSREP, and a chemist working for SOSREP later boarded the vessel to advise on the extent of any pollution.

Attilio Ievoli refloated at 1805, and manoeuvred clear without assistance. She anchored between Hampstead Ledge and Yarmouth at 1920, to await underwater inspection by divers. SOSREP instructed the vessel not to leave until the divers and all other inspections were complete. At 1936 the following day, 4 June, SOSREP gave her clearance to sail and she was issued with new certificates by the classification societies. Sailing was further delayed until a new master joined the vessel.

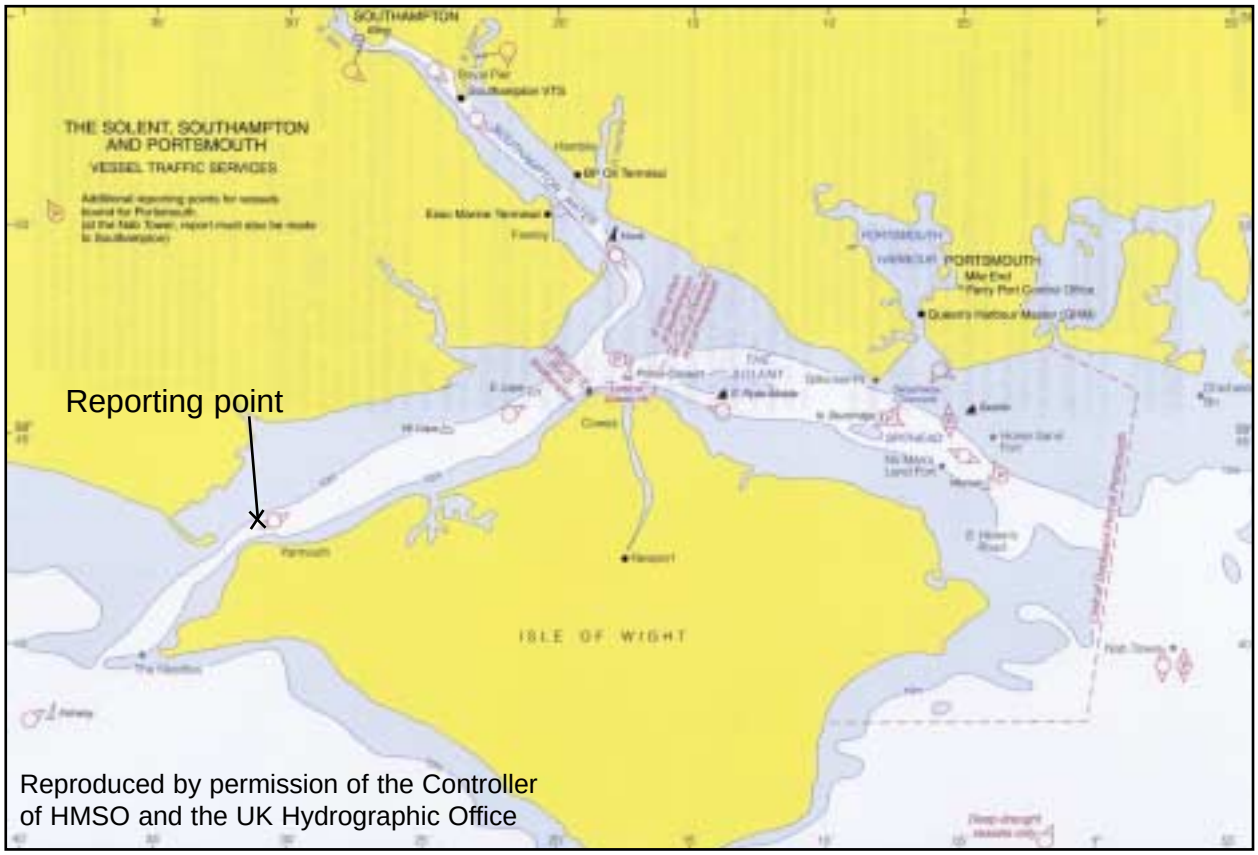
At 0530 the following day, *Attilio Ievoli* continued her voyage to Barcelona.

Figure 3



Southampton pilot area

Figure 4



Southampton VTS area

1.4 ENVIRONMENTAL CONDITIONS

1.4.1 Tidal stream

Tidal streams in the west Solent are referenced to high water at Portsmouth. At the time of the grounding, the tide was an hour before low water at Portsmouth with a larger than average spring tide. The direction of the tidal stream in the vicinity of the grounding position was predicted to be 224° x 1.0 kts at 1608, and 055° x 2.3kts at 1708. The tidal stream was therefore at, or near, slack water at the time of *Attilio Ievoli*'s grounding.

Predicted tides at Lymington

HW	1109	3.0m	LW	1716	0.6m	HW	2324	3.1m
MHWS		3.0m	MLWS		0.7m			

1.4.2 Weather

The visibility was good, the wind was south-westerly force 3 to 4 with a slight sea. The sun was right ahead at an altitude of about 40°, although the sky was covered with light cloud. Sunset was at 2110.

1.4.3 Seabed

The seabed in the area of the grounding was shingle.

1.5 *ATTILIO IEVOLI*

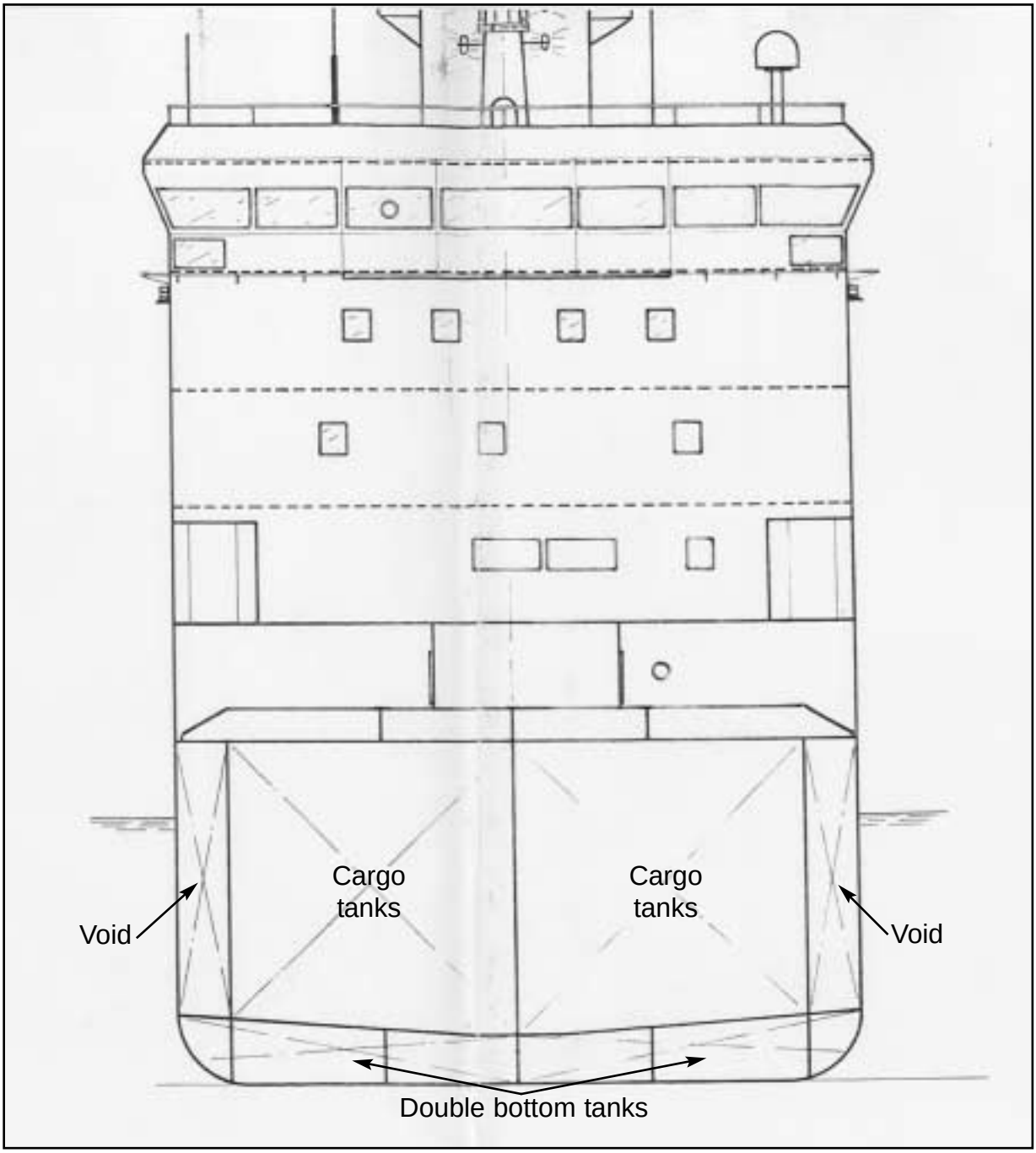
1.5.1 The vessel and crew

Attilio Ievoli is a chemical tanker, built in 1995 for Marnavi S.p.A. of Naples, Italy. She was registered in Naples, and was classed by both the Registro Italiano Navale and Bureau Veritas. She is an IMO type II chemical tanker, therefore no cargo tank is in contact with the outer shell plating, the vessel having 'J' shaped ballast tanks surrounding the cargo tanks **(Figure 5)**.

The vessel was mainly employed in trade between Mediterranean and North European ports, her last three voyages being Tarragona to Antwerp, Antwerp to Rotterdam and Rotterdam to Fawley. She was on passage to Barcelona when the accident occurred.

Her crew of 16 were Italian, with the exception of the Russian chief officer and Ukrainian second officer, first engineer and fitter. Her complement included one deck cadet and one engineer cadet. The official working language on board was English, however, the crew tended to communicate in their own language, unless the communication was between different nationalities when English would be used. Earlier that year, the vessel had been sailing with a total of four different nationalities among her crew.

Figure 5



Cross section of ship from general arrangement plan

1.5.2 The bridge team

The master

The master had been on board since March 2004, and was near the end of his 4 month tour of duty. He first went to sea in 1976, and had been serving as master since 1990. He had been employed by Marnavi S.p.A. for 3 years, and this was his third time in command of *Attilio Ievoli*.

The second officer

The second officer had been on board *Attilio Ievoli* for a week since joining her in Antwerp. He held a chief mate's Certificate of Competency, and had previously sailed as chief officer with other companies. This was the first time he had been employed by Marnavi S.p.A., and he had been given a five-day handover from the previous second officer, who had left the vessel in Rotterdam.

The deck cadet

The deck cadet had been on board for 4 months. He had attended a nautical college in Naples for 5 years, and this was his first year at sea. He had been employed as a deck boy with Marnavi S.p.A. for the first 2 months of this tour of duty, before being appointed as a cadet.

The chief engineer officer

Although the chief engineer officer was on the bridge at the time of the grounding, he was not part of the bridge team. However, he was positioned monitoring the UMS alarms and collating his figures at the port workstation.

1.5.3 Bridge watches

At sea, the master and the cadet kept the 8 - 12 bridge watch, the second officer the 12 - 4 and the chief officer the 4 - 8. In port, the chief officer and second officer shared the cargo work, with the second officer taking the 12 - 6, and the chief officer the 6 - 12 deck watch. The cadet also kept the 8 -12 deck watch in port to assist the chief officer.

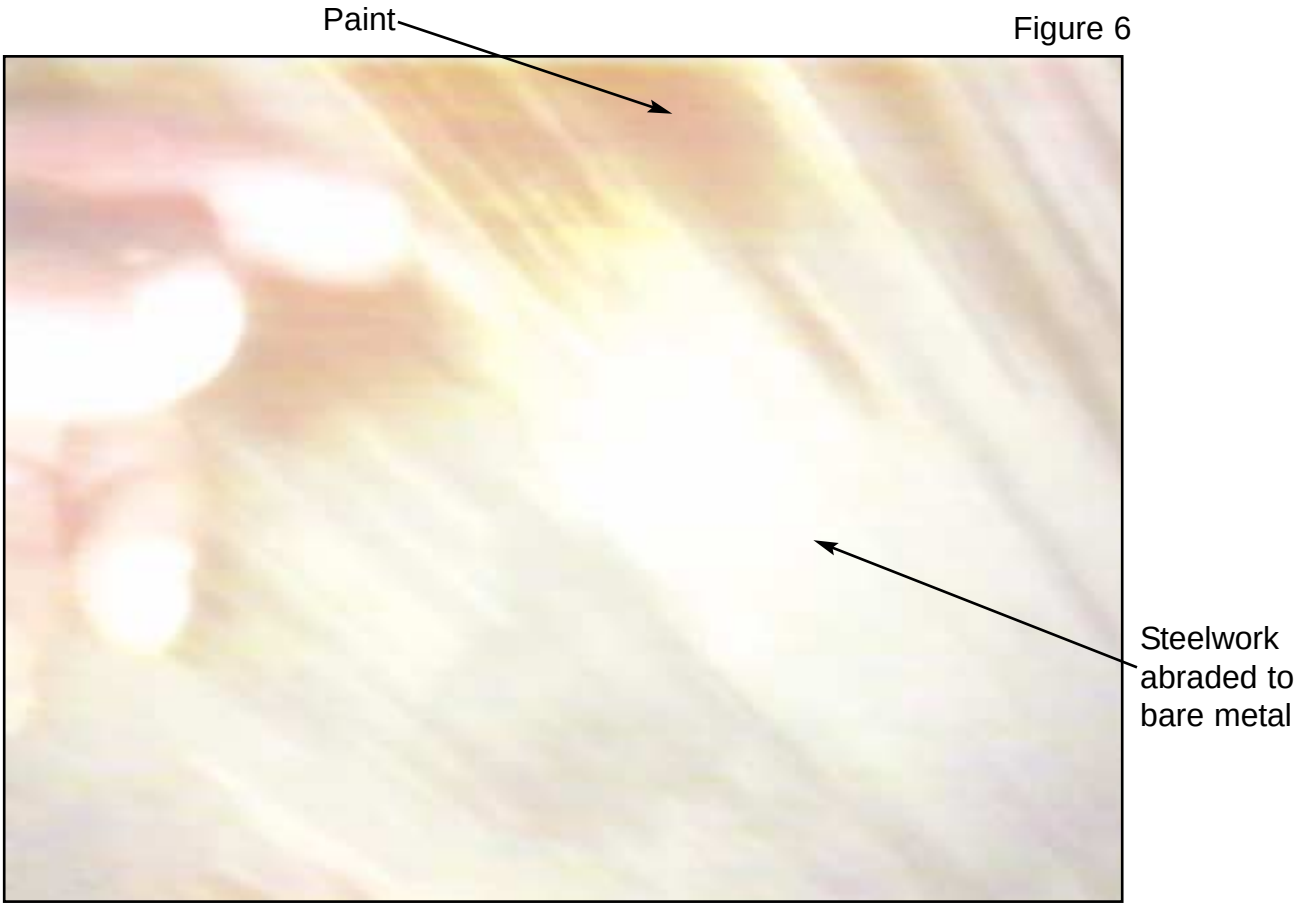
On this occasion, the chief officer had been involved in cargo work throughout the stay at Fawley, so the master was taking the first 4 - 8 bridge watch to allow him to rest.

1.5.4 The damage

On 4 June 2004, UMC International carried out an underwater inspection of *Attilio Ievoli* following the grounding, on behalf of the Maritime and Coastguard Agency (MCA) and the classification society RINA.

Use of the divers was restricted due to the strong tidal stream, so the inspection was limited to the area around the port bow. Longitudinal linear abrasion marks were noted in the paint system, starting about 1m aft of the forward draught marks, and extending to a position just aft of the forward end of the bilge rails. The abrasion was through to bare metal in many places, and estimated to be 1mm in depth at the forward end, decreasing to 0.5mm depth moving aft **(Figure 6)**. An indentation area of approximately 1m x 1m and 30mm depth was discovered, located approximately 4m inboard of the turn of the bilge, in line with the forward end of the bilge rail. No other significant damage was noted.

Figure 6



Still from the underwater hull examination video on 4th June 2004

1.6 MARNAVI S.p.A.

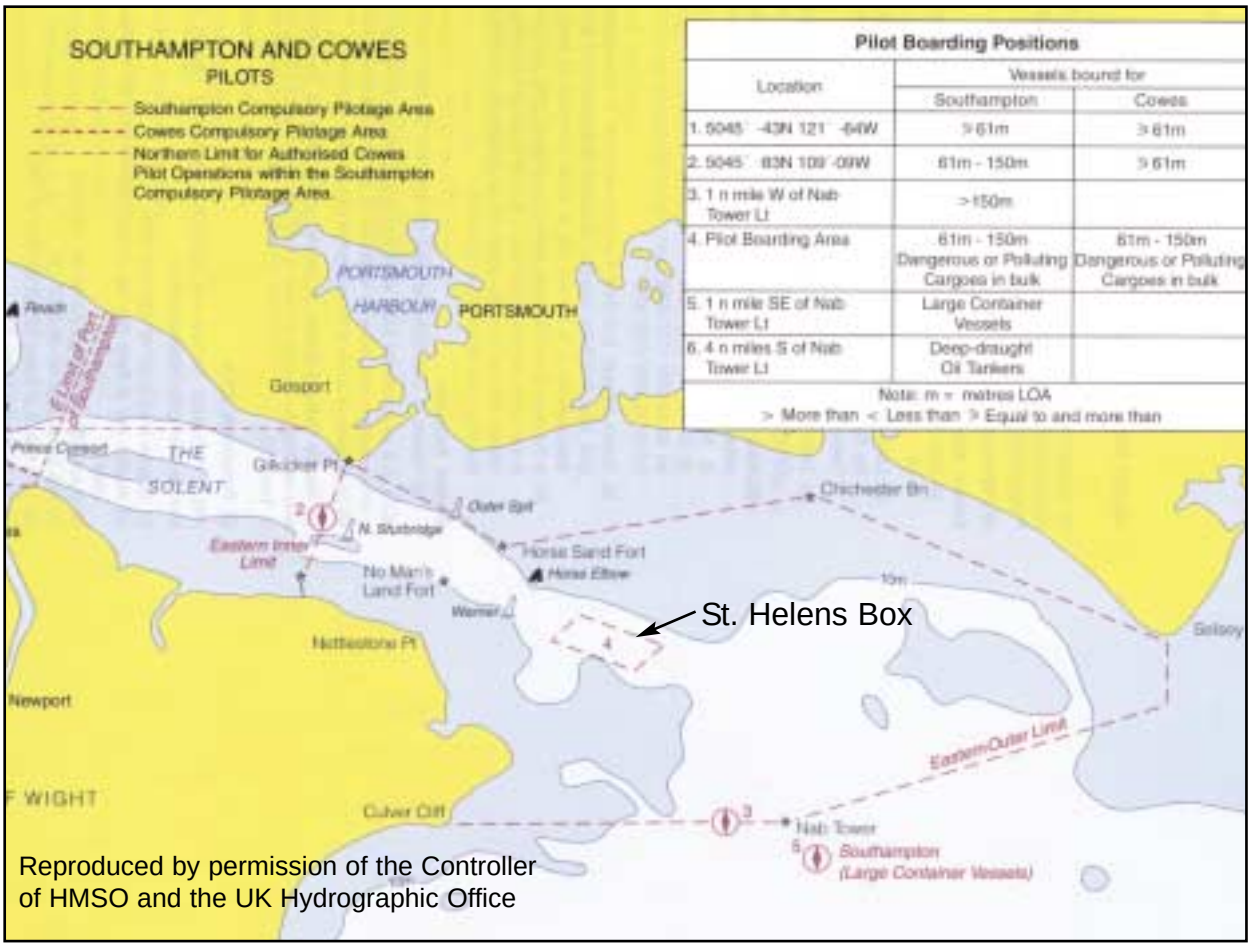
1.6.1 The company

Marnavi S.p.A., an Italian company, was founded in 1980. It was the registered owner of 36 vessels, in three general groups: tankers, offshore supply, and oil pollution prevention.

The company was ISM compliant, and certified to ISO 9002.

As a result of two previous near miss navigational incidents in the east Solent, and in consultation with ABP Southampton, a company instruction was issued requiring all Marnavi operated vessels to take a pilot from the Nab Tower when using Fawley Marine Terminal. A further incident, involving an injury to a pilot boarding these relatively small vessels at the Nab Tower, caused the instruction to be changed, and pilots were required to embark and disembark at St Helens Box, which is a more sheltered area in the eastern approaches to the Solent **(Figure 7)**.

Figure 7



1.6.2 Company instructions

The company had produced a comprehensive *Bridge Organisation Manual*, which was printed along with the *Company Permanent Standing Orders*. The section on *Navigational Safety* was written only in English, and quotes extensively from the ICS *Bridge Procedures Guide* and the Nautical Institute's *Bridge Team Management*.

The bridge permanent standing orders were printed in Italian with a translation into English printed beneath. The English used is a literal translation of the original Italian, and might have caused comprehension difficulties for a reader whose first language was not English.

In addition to the above, the company issued fleet circulars regularly. These circulars required responses from the fleet's masters to ensure that they had been read and understood. On 19 November 2003, one such circular included instructions for embarking and disembarking pilots at St Helens Box in the eastern approaches to the Solent, thereby requiring Marnavi vessels to enter and leave the Solent from the east.

1.7 PILOTAGE

1.7.1 General

Pilotage for this size of vessel was compulsory within the limits of the port of Southampton. The western limit of the port of Southampton is formed by a line joining Stansore Point and Egypt Point, with a pilot boarding point south of the East Lepe Light Buoy. The west Solent, including the Needles Channel, is not a pilotage area **(see Figure 3)**. The IMO had adopted a recommendation stating that laden tankers of over 10,000gt should avoid this channel. A further restriction on the use of the west Solent is in place for gas tankers of 8,000m^3 or 6,000gt. However, use by vessels of any other size and type is unrestricted.

1.7.2 Admiralty Sailing Directions

The *Channel Pilot*, NP27, gives the following information:

> *Vessel traffic services (VTS) Centre embracing VHF communications, pilotage, navigational advisory services, traffic information, data collection and evaluation from Berth 37, Eastern docks, Southampton, for co-ordination of movement of all vessels of 20m LOA or over in The Solent and Southampton Water excluding the Port of Portsmouth N of a line joining Gillkicker Point and Horse Sand Fort Light*.
>
> *The requirement to maintain contact with Southampton VTS Centre cannot be over-emphasised, particularly in the event of unforeseen circumstances developing within the limits of the port*.
>
> *Radar coverage extends from almost as far as Solent Bank in the west, to Nab Tower in the east, with a service area from the East Lepe Buoy in the west Solent, to No Man's Land Fort in the east Solent*.

1.7.3 Advice for the west Solent from the Admiralty Sailing Directions

The route described is for a vessel entering the port, as in all Admiralty Sailing Directions. Warnings on the use of the Needles Channel refer to vessels with a draught of 9.5m or more, so would not apply to *Attilio Ievoli*. Advice concerning tidal streams in the west Solent informs the mariner that set is mainly in the direction of the channel.

Further detail on the route through the west Solent concerns the offlying ledges and banks, which are clearly marked on the UKHO charts of the area (2035, 2036) which were in use on the vessel at the time of the accident. The east-bound route uses Hurst Point Light as a stern mark, and the reciprocal bearings to those given in the sailing directions could have been used when proceeding on a westerly course.

1.8 BRIDGE TEAM MANAGEMENT

Bridge team management can be described as a method of working that ensures reliable, consistent standards of navigation are maintained when based on sound principles and reinforced by effective organisation.

In his book, *Bridge Team Management*[1], published by the Nautical Institute, AJ Swift states the following, which is also repeated in section 1.3 of the *Navigational Safety* section of Marnavi S.p.A's *Bridge Organisation and Company Permanent Standing Orders:*

An efficient bridge organisation will include procedures that :

1. *Eliminate the risk that an error on the part of one person may result in a disastrous situation.*

2. *Emphasise the necessity to maintain a good visual lookout and to carry out collision avoidance routines.*

3. *Encourage the use of all means of establishing the ship's position so that in the case of one method becoming unreliable others are immediately available.*

4. *Make use of passage planning and navigational systems which allow continuous monitoring and detection of deviation from track when in coastal waters.*

5. *Ensure that all instrument errors are known and correctly applied.*

6. *Accept a pilot as a valuable addition to a bridge team.*

It is the operation of these standard procedures that will help ensure the safe navigation of the vessel. There are many different procedures, and types of procedure, that can be used, and their use will depend on the personalities of the team members, their experience and their relationships with one another. The procedures will only be effective if each member of the bridge team is aware of their position within the team, and the actions that they will be required to carry out. The vessel's safety should never depend on the decisions of one

[1] This book builds on the principles established in the ICS Bridge Procedures Guide, and as part of the Bridge Operations programme run by the Nautical Institute and Videotel Marine International, is endorsed by IMO.

person only, with all decisions or orders checked by other members of the team, and the effectiveness of the action monitored. Junior members of the team should be encouraged to question decisions if they think the outcome might endanger the vessel. Effective team management, therefore, is a combination of personal ability, supported by effective routines, which allow for the differing abilities and experience which may be exchanged between the changing members of the team. This will help to ensure that the most effective use is made of resources, both technical and human.

1.8.1 Bridge equipment

The only defect in the navigation equipment on the bridge was that the echo-sounder trace was not working. Because of the chief engineer officer's position at the port radar, the starboard radar was the only one available for navigation.

The echo sounder had an alarm function available, but this was set to zero in contradiction of Marnavi S.p.A's instructions stating that the alarm must be set to the draught plus the required underkeel clearance. In addition, the bridge team did not routinely monitor the displayed depth.

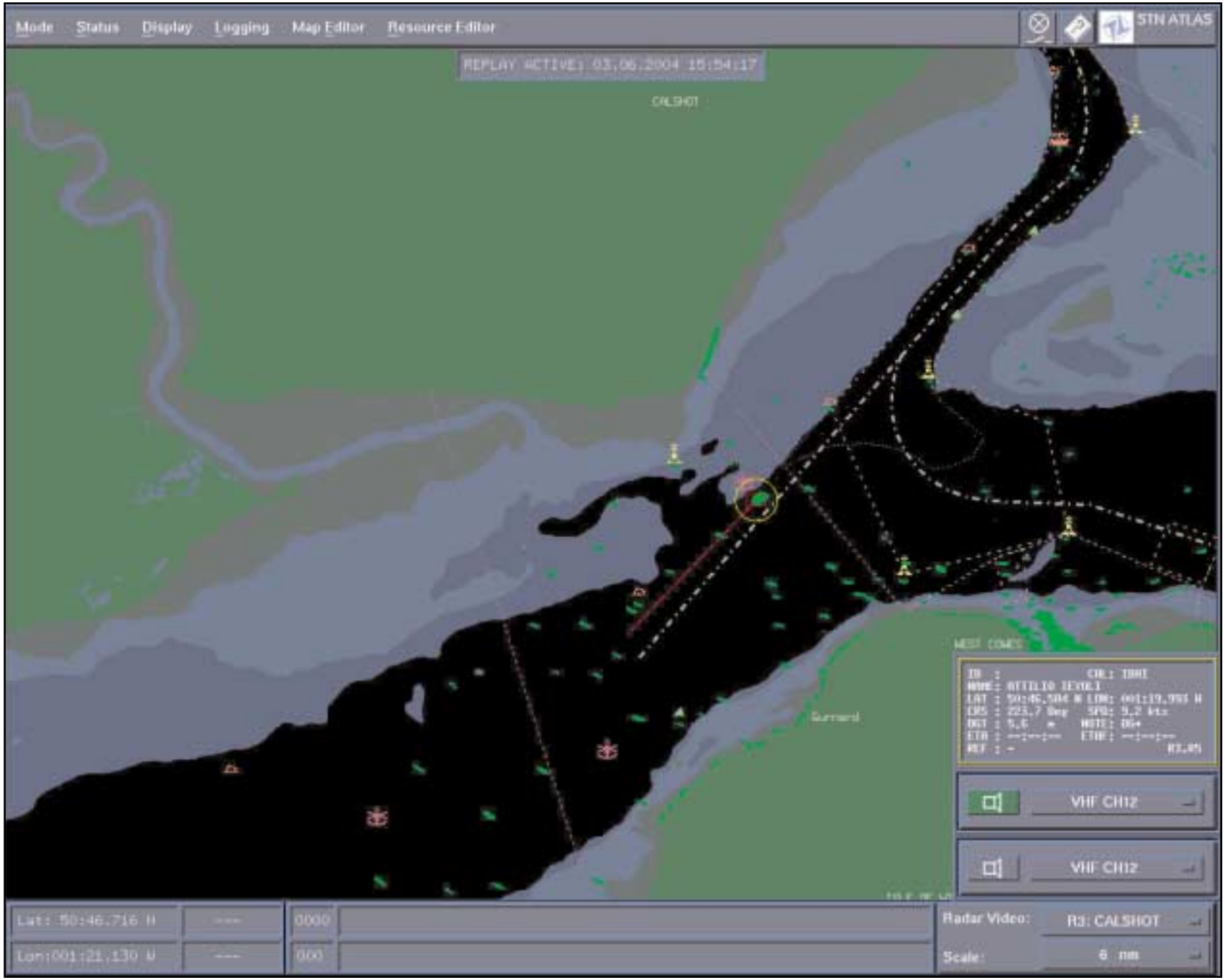
1.9 RECORDED DATA

Recorded data was available from a number of sources to assist in incident reconstruction. VTS radar recordings at ABP Southampton, combined with the VHF radio recordings, gave a single replay of the events as seen and heard by the VTS operators **(Figure 8)**. *Attilio Ievoli* carried an operational course recorder, which showed the time, heading and rudder angle applied **(Figure 9)**.

A voyage data recorder was not fitted, and there is no current legislation requiring one to be fitted to a vessel of this type and age.

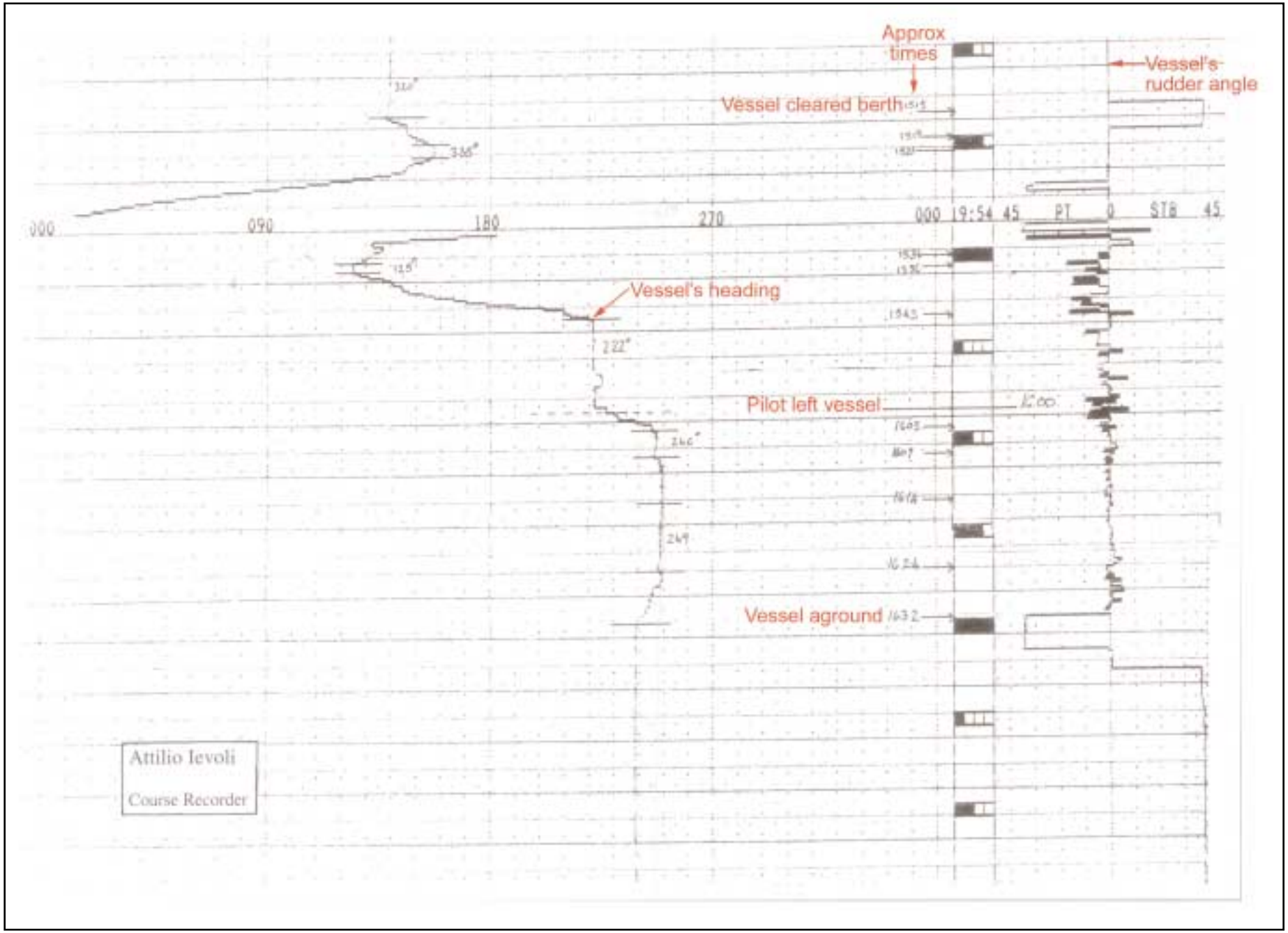
An Integrated Navigation System (INS) was fitted, but this did not have the facility to record historic positional data for future replay.

A GPS unit was fitted above the chart table, but its removal from the vessel, to attempt to download historic positional data which might have been stored, was not considered necessary given the evidence already obtained from other sources.



VTS recording

Figure 8



Course recorder 3 June 2004

Figure 9

1.10 HARBOUR REVISION ORDER - PUBLIC ENQUIRY

With the changes brought about by the Pilotage Act 1987, pilotage in the Solent and Southampton water changed from the control of Trinity House to the competent harbour authority. In the case of Southampton Water, this was ABP Southampton. The west Solent was outside the harbour limits of the port of Southampton, but it was decided to maintain a service in the west Solent as previously offered by Trinity House. Due to the fairly low volumes of traffic using this approach to the Solent, ABP Southampton decided that a limited pilotage service for the Needles Channel and the west Solent was necessary. To this end, four pilots were authorised to provide a service in this area.

In 1993, ABP Southampton decided to apply for a Harbour Revision Order, to extend the limits of the Port of Southampton to the west to include the Needles Channel. This would have required them to provide a full pilotage service for the west Solent, and included the requirement to maintain a regular survey of the depths in the Needles Channel, and the maintenance of buoyage and navigation marks. Trinity House had previously provided these services, including quarterly surveys of the Needles Channel. Once Trinity House was no longer the pilotage authority for the Solent, these surveys reverted to a less regular cycle. Consequently, pilots were required to demonstrate local knowledge in an area of shifting banks and strong cross-currents, using survey information which could have been out of date.

A public enquiry was held in October 1995 into ABP Southampton's application for a Harbour Revision Order. The application was finally rejected on three grounds[2]. These were:

a) *ABP do not need control over the Western Solent to extend the Harbour Master's radar coverage there - most commercial traffic uses the eastern approach where radar coverage begins outside the port limit;*

b) *The main difficulties for ships using the port are alleged to be at the Brambles Turn where ships enter Southampton Water from the Solent - these do not justify a westward extension of the port limit of over nine miles;*

c) *It would be not desirable to increase commercial use of the Needles Channel and it is already managed to the satisfaction of the relevant authorities.*

ABP Southampton had no wish to provide a pilotage service which they could not support thoroughly, so withdrew the pilotage service from the west Solent. Pilotage in the west Solent is now available only from the East Lepe Buoy, just outside the western limit of the port.

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[2] As reported in 'Lloyd's List' July 26 1996

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 FATIGUE

Fatigue was not an issue in this accident. *Attilio Ievoli*'s master had not been involved in the cargo work in port, and had benefited from a full night's rest. The second officer was rested, but his work/rest periods were analysed using the Fatigue Analysis tool developed for the MAIB by QinetiQ. This gave him a "slight risk" fatigue rating. The cadet had maintained his 4 on, 8 off, sea watch routine in port so he, too, was rested.

2.3 HUMAN FACTORS

The MAIB contracted QinetiQ's Centre for Human Sciences to research the human factors aspects of this accident, specifically with regard to bridge teamwork. QinetiQ's report is included in **Annex 1**, and is summarised below.

The human factors failures started with the master's decision to use the west Solent, even though he knew this to be contrary to company instructions. Sea conditions and visibility were good, and there would have been a possible 4-hour saving of steaming time by using the western passage instead of the eastern passage.

From the departure of the pilot at 1600, the crew members do not appear to have been clear as to their own and others' roles and responsibilities. Task performance was not co-ordinated, and there was little overt management and supervision. The ultimate consequence of this was that, at the time of the grounding, the bridge team had no shared appreciation of *Attilio Ievoli*'s position.

Language was not an issue here, as both master and second officer spoke adequate English. However, the contrast of cultures was significant. Different cultures have different attitudes to the importance of hierarchy in the workplace. For example, research has shown that eastern European cultures (such as Ukrainian) expect a far greater deference to be shown to superiors than most western cultures, such as the Italians. This is known as the "*Power Distance".*

With this in mind, it is possible that the second officer was reluctant to question the master's authority or competence, and was unsure how to act after 1600 when his own watch had ended, knowing that the master and the cadet were taking the next watch. He was given no instruction by the master, who assumed that the second officer would "know what to do". In any event, the master accepted a poor standard of teamwork, which, when combined with the cultural differences between the team members, led to role confusion among them.

The QinetiQ report concluded that:

> *… the Master's decision to take the vessel through relatively hazardous waters, without a pilot, and under automatic steering must be questioned. The risks inherent in this scenario were compounded by poor team management, resulting in an inappropriate division of tasks, and a lack of accurate positional awareness. The 2/O knew that the vessel was not following an appropriate course but failed to communicate this to the master. The poor standard of teamwork accepted by the master probably contributed to this failure. Language difficulties probably did not play a part, but cultural differences and communications practice may well have made a contribution.*

2.4 BRIDGE TEAM MANAGEMENT

For a bridge team to work effectively, each member of the team must know precisely what duties are expected of them. This can be achieved by holding a short departure briefing, at which each member of the team is told the plan for the departure, and their role in it. This has the added advantage that everyone is clear about everybody else's responsibilities.

In this case, no briefing took place, and assumptions were made as to the job each was required to perform. Neither the second officer nor the cadet was sure who was responsible for fixing positions on the chart, and the master did not clarify the situation. Further, the second officer was unable to concentrate on monitoring the vessel's position because he was used for more menial tasks such as taking down the pilot flag. The cadet should have been employed for this task. The cadet was plotting "positions" on the chart when abeam of buoys and assumed that *Attilio Ievoli* was on track. This did not confirm her position, since only one position line was in use (a minimum of two are required to fix the vessel's position). The second officer was plotting the position as a range and bearing off the buoys, ie using two position lines. Subsequent reconstruction of the ship's track, using VTS radar information, confirms the second officer's fixes were correct. When he voiced his concern that the vessel was to the north of the planned track, and received no response from the master, he did nothing further to bring the master's attention to the approaching problem. As described in the QinetiQ report, this reluctance to challenge the master is thought to be a result of a combination of cultural differences and communications practice on board. This would have been exacerbated by the fact that he had only joined *Attilio Ievoli* recently, and had not been told what was expected of him.

Procedures are also required to ensure that the electronic aids to navigation are correctly used. Two radars were available to the bridge team. The port radar, although fully operational, was not in use because the chief engineer was sitting in front of it, monitoring the UMS alarms and performing his fuel consumption and other voyage calculations. The port workstation should have been available to the second officer who could then have monitored the vessel's progress using

the port radar and parallel indices. The echo sounder had an alarm function available, but this was set to zero in contradiction of the Marnavi S.p.A's company instructions, which stated that the alarm must be set to the draught plus the required underkeel clearance. In addition, there was no system for the routine monitoring of the displayed depth, and the echo-sounder trace was not working.

Throughout the time that *Attilio Ievoli* was transiting the west Solent, her master was sitting in the chair on the starboard side of the console, while the chief engineer was sitting on the port side. These two workstations correspond to the description given by the IMO's *Guidelines on Ergonomic Criteria for Bridge Equipment and Layout*, which state that the workstation for navigating and manoeuvring should be on the starboard side, and the workstation for monitoring to port. However, the guidelines state that the workstation for monitoring *serves for relieving the navigator at the workstation for navigating and manoeuvring and/or for carrying out control and advisory functions by master and/or pilot*. Clearly, the second officer should have had access to the port console to take information from the second radar, instead of having to lean past the master to use the starboard radar. Had the bridge team conducted a formal pre-departure briefing, this problem might well have been identified and addressed before the vessel sailed.

In conclusion, there was no pre-sailing briefing to define the roles to be assumed within the bridge team, no regular fixing of the ship's position was undertaken, the port radar was not available to the second officer and the echo sounder was not being operated effectively.

2.4.1 Missed early indications

Analysis of the recording of *Attilio Ievoli'*s heading and rudder angle showed that, initially, when alongside Fawley, the course recorder was aligned to a heading of 320°. This indicated that it was correctly aligned with the gyrocompass, as the line of the berth is also 320°. Later, it showed that the vessel was on a steady heading of approximately 249° from about 1614 to 1624. This coincided with the passage from the East Lepe Buoy through the west Solent. It is of note that the planned track at that stage was 246°, and that a heading of 249° would have increased the vessel's displacement to the north of the planned track. From 1624 to 1632, the heading altered slowly to port, from 249° to 240°, yet the autopilot had applied starboard helm. This indicated that before grounding, *Attilio Ievoli* was experiencing bank effect/interaction, which was pushing her bow to port. The autopilot attempted to counteract this heading change by applying starboard helm, to a maximum of 10 degrees. This early indication of reducing depth of water was consistent with the increase in vibration and engine noise which caused the chief engineer officer to leave the bridge before the grounding. However, the bridge team did not appreciate the cause.

2.4.2 Mobile telephone

The mobile telephone was in use on the bridge for the majority of the time between the pilot disembarking and the vessel grounding. It is known that the master made some, if not all, of the calls during this period. With the remainder of the bridge team unclear of their relative responsibilities for navigation, and the master distracted on the telephone, no-one appears to have been concentrating on the safety of the vessel.

It was reported that the master failed to hear the second officer's position reports at 1600 and 1610 stating that *Attilio Ievoli* was to the north of the planned track. The fact that the master was most likely on the telephone at the time could account for this. Nevertheless, if the bridge team had been working effectively, the second officer would have ensured the master acknowledged the position report.

Use of mobile telephones in the approaches to a port should be restricted, for both incoming and outgoing calls. This can be achieved by designating pilotage, and other restricted waters, as 'red zones', in which outgoing mobile telephone calls are prohibited, and incoming calls must be diverted to a message service. Use of this technique, or similar control measures, ensures that mobile telephones are not a distraction for the bridge team at a time when they should be concentrating fully on the navigation of the vessel.

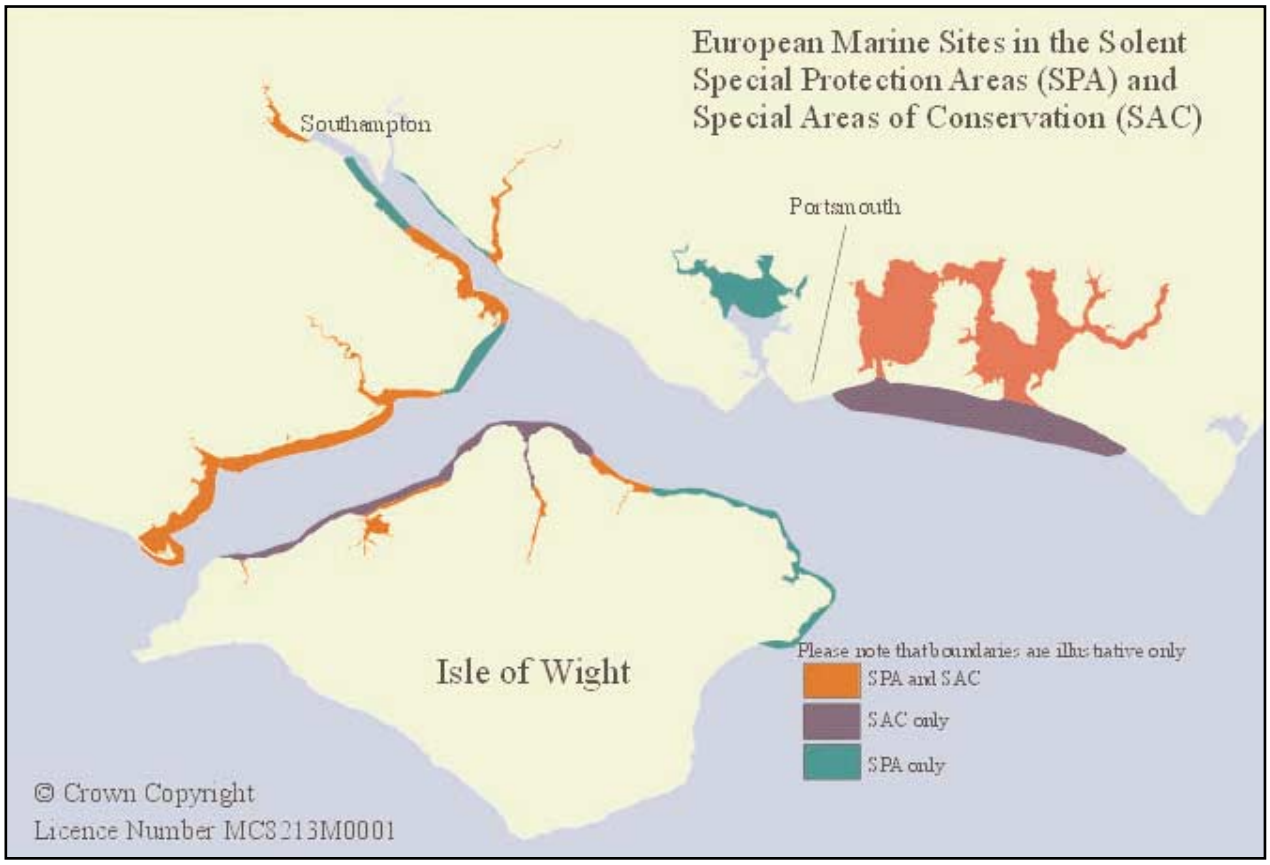
2.5 TRAFFIC MANAGEMENT IN THE SOLENT

Because of the available depth of water for vessels using the Needles Channel and the west Solent, the majority of vessels visiting Southampton do so from the east. Pilotage is offered from the Nab Tower, and a VTS service covers the area, through agreement with the Queen's Harbour Master (QHM) Portsmouth. From a navigation perspective, the eastern approach to Southampton is less challenging than the western approach, yet only the eastern approach is provided with a pilotage service.

Various vessels and vessel types use the west Solent to approach ports in the Solent. These range from small coasting vessels, both tankers and dry cargo, to large passenger vessels. None, regardless of size, have an official pilot onboard, few have local knowledge, and their movements are not monitored by any shore-based traffic management system.

The foreshore on both sides of the west Solent is designated as either a *Special Protection Area*, a *Special Area of Conservation*, or both **(Figure 10)**. The potential for severe environmental consequences, following a marine accident in this conservation and protection area, are clear. It was fortunate that *Attilio Ievoli* ran aground on shingle, which, while damaging the vessel's external paintwork, did not lead to penetration of her hull.

Figure 10



Special conservation areas

2.5.1 Pilotage and VTS

Before the change of pilotage authority from Trinity House Pilots to ABP Southampton on 1 October 1988, the west Solent had been a compulsory pilotage area under Trinity House. The Port of Southampton had applied for a harbour revision order in 1995, to extend the harbour limits to include the west Solent and so provide a pilotage service there. After a public inquiry, the application was rejected. The west Solent lies outside the harbour limits of the port of Southampton, and a pilotage service is not offered, neither is the area covered by shore-based traffic monitoring systems.

The application for a harbour revision order was made to improve the safety of navigation in the west Solent. The implementation of this revision order would have included the re-introduction of compulsory pilotage and the inclusion of the area in the radar coverage of Southampton VTS. Additionally, ABP Southampton would have taken responsibility for buoyage and survey in the west Solent. Trinity House still retains this responsibility. Before 1988, Trinity House surveyed the Needles Channel approximately every 3 months, and the position of the Shingles Bank was closely monitored. Since 1988, the survey of the channel has reverted to less regular intervals, and up to date information concerning depths and the position of the banks is scanty.

A VTS service can be described as *a service intended to assist in the navigational decision-making process on board and to monitor its effects.* To provide this service, a port must be able to effectively track a vessel's movements, and for most service providers this means the use of radar to cover the port and approaches.

VTS radar coverage of the west Solent is limited to the areas described in section 1.7.2 and covers the area of the pilot boarding area at the East Lepe Buoy, and a little further into the west Solent. VTS reporting points were established for the west Solent **(Figure 4)**, but these are to give Southampton VTS warning of vessels entering and leaving from/to the west. VTS had no authority to organise the movement of vessels in the west Solent since this area lies outside the western limit of the port of Southampton.

The waters of the west Solent are classed as UK internal waters, and vessels may transit them under the rights given in UNCLOS for innocent passage when proceeding to or from a port. This means that any vessel transiting these waters does so without hindrance.

On the day of the grounding, the ship's agent had ordered a pilot for passage to the east, which was in accordance with Marnavi S.p.A's company instructions. However, on boarding, the master informed the pilot that he intended to make a passage via the west Solent. The pilot was employed to pilot the vessel to the edge of the pilotage area, and had no authority to insist on which route should be taken. Therefore, after discussing the plan with the master, the pilot navigated *Attilio Ievoli* to the western disembarkation point, and left the vessel. VTS was aware of Marnavi S.p.A's company instructions, but did not have the authority to stipulate which route she should take.

The powers of a harbourmaster to give directions, are described in the Port Marine Safety code, which refers to Section 52 of the Harbours, Docks and Piers Clauses Act 1847, stating:

> *The harbour master duly appointed by a harbour authority has powers of direction to regulate the time and manner of ships' entry to, departure from and movement within the harbour waters, and related purposes*

This confers the harbourmaster authority over shipping movements within the port, the condition of the vessel (trim, list, heel, seaworthiness) before movement within the port, and the use of tugs for towage, escort or berthing. It does not, however, confer authority over the route to be taken by the vessel outside the harbour limits. Section 1.3.8 of the Port Marine Safety Code describes the harbourmaster's "*powers to regulate the movement of vessels carrying dangerous goods"*, given under the Dangerous Vessels Act 1985. Again, this does not grant the authority to stipulate the route to be followed by a vessel; instead it relates to such things as notice periods, clear channel routines, and moving safety zones.

This leaves the harbourmaster, and by extension the VTS officers as his authorised assistants, in only an advisory capacity with respect to the route a master may wish to follow. In this case, the VTS and the pilot did not advise the vessel's master that he should take the east Solent passage.

In conclusion, the west Solent is an environmentally sensitive area, where the foreshore on both sides is either a *Special Protection Area*, a *Special Area of Conservation*, or both. Under UNCLOS rights of innocent passage, it cannot be closed to transiting vessels. To have this area outside the coverage of a VTS system, and not in a pilotage area, puts it at risk, as demonstrated by the grounding of *Attilio Ievoli,* the recent grounding of *Katia* (see MAIB report No 8/2004) and other associated reports of hazardous incidents in the area.

The MAIB believes the need for effective control of shipping in the west Solent and Needles Channel is compelling if a major accident is to be avoided in the future. It further believes the decision of the public inquiry to deny ABP the opportunity to extend its port limits to the west and, either by powers of direction, or through the provision of a pilotage service, provide effective control of shipping in the area, should be revisited. In this respect, the MAIB recommends the Department for Transport to ensure the establishment of traffic control measures for all commercial vessels over 500gt using the west Solent and its approaches.

2.5.2 Reporting of grounding

The records of VHF radio conversations between *Attilio Ievoli* and VTS showed that these were entirely routine reports, as required for transit of the west Solent. However, the report made by *Attilio Ievoli* off Yarmouth, at 1631, was indistinct, and although the VTS operator asked her to confirm that the call had been for passing Yarmouth, the reply received was "*OK*". It is not certain that this response came from *Attilio Ievoli*, but, if it did, the lack of positive response might have indicated that she was already aware of her predicament. Four minutes later, at 1635, the yacht *Lone Star* called VTS to report a tanker apparently aground off Lymington. VTS alerted Solent Coastguard to the fact that a vessel had gone aground off Lymington.

Attempts by Solent Coastguard to contact *Attilio Ievoli* by VHF radio were unsuccessful until 1720, when a report was received from her saying that she was being checked for ingress of water, and that this task would not be finished for about 30 minutes.

It is of concern that, in this environmentally sensitive area, a chemical tanker could have been aground for some 45 minutes without it being reported to the coastguard, except by a chance passing yacht. VTS radar coverage and compulsory pilotage would redress this concern.

2.5.3 Buoyage in the west Solent

The deep water of the west Solent is confined mainly to the southern side of this stretch of water. This channel is not well defined with navigational buoys. The two dangers in this area off the coast of the Isle of Wight are marked with starboard hand buoys, which are approximately 3 miles apart. Other than seasonal yacht racing buoys, the northern side is unmarked from the West Lepe buoy to Hurst Point, a distance of 6 miles.

For a vessel travelling at 12 knots, this means that there is a period of 30 minutes in which there are few visual references to indicate position with respect to the deep water. Although Hurst Point is normally visible, and can be used as a head mark, the vessel's displacement to the left or right of a planned track can be noted but not evaluated. The placing of additional buoys in the west Solent to mark the deeper water, would give the mariner a ready reference to his proximity to danger, and help to improve the safe navigation of this waterway. However, while this measure would reduce one of the hazards to vessels transiting the area, it would not obviate the compelling need to provide an effective regime of traffic control in the west Solent and Needles Channel as discussed in 2.5.1.

2.6 PLANNING AND COMPANY INSTRUCTIONS

The only specific company instructions regarding navigation in the Solent were contained in the company circular of 19 November 2003. These prescribed the embarkation and disembarkation of pilots at St Helens Box in the eastern approaches to the Solent, designed to ensure that their vessels always use the eastern Solent. The master chose to disregard these instructions when departing, on both this and his previous visit to Fawley 6 weeks earlier. The decision to depart using the western Solent was based on the reduction in the length of the passage to the next port, which would have been about 4 hours.

Marnavi S.p.A's instructions for passage planning were contained in its *Bridge Organisation Manual and Company Standing Orders*. The instructions followed closely the requirements detailed in the IMO resolution A 893(21) *Guidelines for Passage Planning,* and was printed only in English.

2.6.1 Passage planning

The plan was "berth to berth", and was divided into three stages, namely berth to sea buoy, sea buoy to sea buoy, and sea buoy to berth. For each stage, a printed form was available, within the ISM documentation, for listing the waypoints, courses and distances, position fix interval and method, references such as tide tables and pilot books, VHF radio working channels, currents and parallel index information. Finally, a remarks column allowed for additional information to be added to the plan. The form could be computer generated with the information typed in, or printed and hand-written.

Both this passage plan, and a previous plan for the departure from Southampton via the west Solent, had been part-typed and part hand-written. The typed columns were those concerning waypoint number, position, course, distance, with the parallel index information typed as *see chart*, and the position fixing method typed as *visual/radar/GPS*. This gave the impression that the plan was created by linking a series of stored waypoints. While this procedure might have used a previously tried and tested route, it did not mean that the navigator had decided why he was using that route, and an important part of the appraisal stage of passage planning had been lost. The result was that the passage plan became an exercise in joining waypoints, rather than a proper evaluation of the safe route for the vessel.

In assessing the areas of safe water for a vessel to transit, it is good practice to highlight the areas where the depth of water is insufficient for safe navigation. The minimum depth of water to permit safe navigation is calculated taking into account height of tide and vessel's draught and the effect of squat. It is known as the "safe water limit". This technique is often referred to as marking the "no-go" areas. The lines have to be prominent in order to highlight the immediate danger quickly and effectively at any time under any light condition. One method is to draw a pencil line connecting the minimum depths as shown on the chart, and then to hatch the line on the side where danger exists. The Marnavi S.p.A. company instructions detailed this technique, and recognised that the safe water limits should be marked using a *UniMarkerase* pen, which was an erasable water-based marking pen. This would allow the safe water limits to be changed, if necessary, for the next visit to the port. However, on this occasion, the safe water limits had been marked in red crayon at a depth slightly under 10 metres. This did highlight the minimum depth, but it would not have been possible to erase this line for future visits.

In producing the passage plan, the assessment did not include all available information. The planning stage employed a series of previously used waypoints, which were not positioned to follow the routing advice in the Admiralty Sailing Directions. The planned monitoring of the track through the Solent was poor, since it relied on position fixing (of doubtful quality in this case), and the use of parallel indexing off buoys, some of which were seasonal yacht racing buoys.

There was no independent method planned by the navigator to confirm his cross track error or, more importantly, his position within the available width of navigable water.

2.6.2 Radar and parallel index

The passage plan included parallel index information. This technique, when properly applied, allows for continuous monitoring of the vessel's position in relation to the planned track, and has the advantage that displacement from the planned track is readily apparent from a glance at the radar screen. The system relies on the navigator setting up the parallel index information correctly, but this can be confirmed by plotting the vessel's position on the chart at regular intervals.

The radar on *Attilio Ievoli* did not have a specific parallel index function. Instead, the navigator had to drop the electronic bearing line (EBL) onto a cursor. The EBL was then aligned with the planned track, and the cursor moved to the correct lateral position from the centre of the display using a tracker ball control. Although the system worked, there was a possibility of accidental movement of the tracker ball without the operator noticing. This was not an ideal application of the technique. The cursor was also used to identify those targets to be acquired by the ARPA. When a new target appeared on screen, the cursor was moved over the top of the target, and an acquire button was pressed to start the ARPA tracking process. To use the ARPA facility required the parallel index to be moved, increasing the chance that it would be incorrectly replaced.

A software fix is available to allow the addition of an independent parallel index function to the radar.

2.6.3 Position fixing

Marnavi S.p.A's company instructions required continuous monitoring techniques such as parallel indexing to be in use in restricted waters, and also required that positions were fixed on the chart, using, where possible, three visual bearings. This would cross-check the parallel index information. The frequency of the fixing should be established in the passage plan and the whole approved by the master. Since a position marked on the chart is mainly historical, in confined waters an estimated position should be developed for the next fix interval to give early warning that the vessel is running into danger. The second officer did not do this, so was unable to warn the master that the vessel was heading for the shoals off Lymington.

The second officer was plotting positions as a range and bearing off the buoys as they were passed. This at least used two position lines and could be seen as positively identifying the vessel's location. The cadet, however, was simply putting an estimated position along the track line marked on the chart at the time the buoys passed abeam of the vessel. This provided an indication of the vessel's progress along the track, but did not provide the bridge team with an indication of any cross track error.

2.7 CHARTER PARTY AGREEMENTS

Charter party agreements are contractual agreements between a shipper and a vessel operator, and determine how a cargo is to be loaded and carried between ports. In general, charter party agreements consist of a series of standard clauses, with additional voyage-related clauses inserted as required. These clauses may well give details of the routes to be followed between ports, special requirements for weather routing, speeds, fuel consumption etc. It is usual for large operators to have a series of standard charter party agreements, to which will be added particular clauses as required. The vessel is told the identity of the standard charter party agreement and any additional clauses, or clauses that do not apply. The vessel then needs to have available the standard charter party clauses to ensure that the voyage was carried out in compliance with the charter party agreement to honour the contract.

At the time of the grounding, Marnavi vessels did not have on board the full charter party agreement. The vessels were informed of cargo data, lay days, speed, consumption, tank cleaning clauses, shippers, receivers and draught/port restrictions if any, but they could not refer to the standard clauses. As a result, the vessels were unaware of all the contractual obligations of the charter party agreement in force at the time.

Since the accident, the company has instigated a procedure for all its vessels to carry the standard agreements.

2.8 INTERNATIONAL SAFETY MANAGEMENT SYSTEM

Attilio Ievoli was certificated under the ISM Code, having last been audited for its SMC on 31 December 2000 by Registro Italiano Navale.

The company's instructions and standing orders formed the relevant part of the vessel's safety management system with regard to bridge operations. MAIB considered these to be comprehensive.

As the company and the bulk of the crew were Italian, it might have been useful for all relevant documentation to have been translated into Italian. However, since the working language on board was English, no translations were required.

The safety management system was satisfactory and, had the procedures and instructions regarding the use of the navigational procedures been adhered to, the accident would not have happened.

2.9 INDEPENDENT SHIP AUDIT

Chemical Distribution Institute (CDI) inspected *Attilio Ievoli* on 12 May 2004. This was valid for 13 months, and was used by the chemical industry as part of a risk assessment process. The inspection was designed to confirm the operational and statutory status of the vessel. The inspection took approximately 10 hours to complete, and consisted of a list of questions to which the answer was either "yes" or "no"; a short explanation being required for the "no" answers. The questions were divided into groups by operational area, and further sub-divided depending on whether it referred to a statutory requirement, a recommendation, or a desirable addition.

In Section 3 of the report, dealing with navigation and bridge organisation, 4 of the 89 questions were negative answers. These were:

3.26 *The NAVTEX is operating on the appropriate station(s) for the ship's location*

3.32 *A record of compass error is maintained*

3.46 *The ship is fitted with an Electronic Chart Display System*

3.70 *The operational condition of the Echo Sounder appears satisfactory*

This independent review of the vessel's status had, therefore, highlighted four areas of concern with the bridge operation, three of which were relevant to the grounding accident on 3 June 2004.

The Navtex must be set to the appropriate stations for the vessel to receive navigation warnings for the area. This is a straightforward operation and can be corrected in minutes. There were no warnings for the area at the time, so this was not considered a factor in the grounding.

Attilio Ievoli was being steered using the autopilot, fed from the gyrocompass. The course recorder showed that, while she was alongside, the gyrocompass was correctly aligned with the direction of the berth. Since during the MAIB visit to the vessel on the day following the grounding, all the gyrocompass repeaters were aligned to the same heading, it was expected that the compass was reading correctly throughout. However, the vessel had turned through 180°, which may have affected the reliability of the heading information, and there were no checks carried out using the many transits available in the Solent. The routine checking of compasses did not form part of the bridge team's routine procedures, since no transits had been highlighted in the passage plan and no results recorded.

Attilio Ievoli was neither fitted with, nor was required to be fitted with, an Electronic Chart System (ECS). Available to the bridge team was an Integrated Navigation System (INS), which did display a rudimentary chart, but due to the scale of the display this was used mainly for monitoring track when in open waters. Had the vessel been fitted with an ECS, the bridge team would have had an indication of their track at a scale commensurate with the area being navigated. Alarm settings, had they been in use and correctly set up, could have given early warning of the approaching danger of grounding, and the probability that the vessel would have run aground would have been reduced.

The echo sounder recorder was faulty at the time of the accident, although spares had been ordered. However, an indication of the depth of water was available from a number of digital readouts around the bridge. The echo sounder was fitted with an alarm function, but as this was set to zero, it was of no assistance in giving the bridge team an early warning of the reduced depth of water.

In conclusion, Marnavi S.p.A. was made aware of the four areas of concern identified by the CDI inspection, three of which had some relevance to the grounding accident in the west Solent.

SECTION 3 - CONCLUSIONS

The following are the safety issues which have been identified as a result of the MAIB's investigation. They are not listed in order of priority, but in the order in which they appear in Section 2.

1. Fatigue was not an issue in this accident. [2.2]

2. Poor teamwork, exacerbated by cultural differences, was a significant factor in the accident. [2.3]

3. No pre-sailing briefing was given to define the roles to be assumed within the bridge team. [2.4]

4. The port radar was not available to the second officer as the chief engineer was using the workstation to monitor the UMS alarms. [2.4]

5. Contrary to company instructions, the echo sounder alarm was set to zero, and the echo sounder trace was not functioning, giving the bridge team no early warning of the reducing depth of water. [2.4]

6. The vessel's mobile telephone was in use on the bridge before the accident. The use of mobile telephones can detract from the safe navigation of a vessel in confined waters. [2.4.2]

7. No pilotage service was available for the west Solent, and this restricted waterway was not under VTS surveillance. [2.5.1]

8. The need for effective control of shipping in the west Solent and Needles Channel is compelling if a major accident is to be avoided in the future. [2.5.1]

9. The vessel did not report the grounding to the coastguard. [2.5.2]

10. There is a lack of navigational buoys in the west Solent. [2.5.3]

11. The course being steered was not that planned, and this increased the displacement to the north of the planned track. [2.4.1]

12. The passage plan did not follow company instructions or IMO advice. [2.6.1]

13. A parallel indexing technique was not in use, although the function was available on the radar and was a requirement of the company instructions. Planned parallel index marks were unsuitable. [2.6.2]

14. The bridge team did not comply with the specific requirements of the company safety management system, as it affected passage planning and navigation. [2.8]

15. The responsibility for position fixing was not defined and the method of position fixing was inadequate. [2.6.3]

16. The vessel's staff were unaware of any restrictions or requirements of the charter party agreement. [2.7]

17. Marnavi S.p.A. was made aware of four areas of concern relating to the bridge equipment 3 weeks before the accident. Three of these had relevance to the grounding. [2.9]

18. The vessel was not fitted with an electronic chart system, which would give the navigator a virtually continuous and accurate position of the vessel shown on a chart of the appropriate scale. Had one been fitted, and monitored, the probability that the vessel would have run aground would have been reduced. [2.9]

SECTION 4 - ACTION TAKEN

Since the grounding, Marnavi S.p.A. has introduced a *Shipping Operations and Improvement Plan* which includes the following actions:

- Company instructions on using the east Solent have been reinforced.
- A fleet-wide letter from the owner has been issued, reminding all personnel of the necessity of complying with company instructions.
- A series of unannounced on board technical and safety audits has been initiated.
- A company director is to visit each vessel at least once a year.
- Vessel visits by office staff are to be monitored against a defined programme.
- The findings from the vessel visits are to be presented to the board of company directors every 6 months.
- All masters are to be briefed on recent incidents, together with why the company is concerned, and will be reminded of company instructions and procedures.
- Additionally, standard charter party agreements are now available on all vessels in the fleet.
- The company is also considering the provision of bridge resource management courses for deck officers.

SECTION 5 - RECOMMENDATIONS

The Department for Transport is recommended to:

2005/105 Take action, working as necessary with the Competent Harbour Authorities of Southampton, Cowes, Lymington and Yarmouth IoW, to ensure the establishment of an effective regime for the control and direction of all commercial shipping of 500gt or above using the western Solent or Needles Channel. Such action should include the provision of appropriate VTS coverage, a suitable pilotage service and improved survey of navigable waters.

The Corporation of Trinity House is recommended to:

2005/106 Review the buoyage in the west Solent in order to better define the available deep water route.

Marnavi S.p.A. is recommended to:

2005/107 Ensure that all deck officers receive training and, where necessary, refresher training in bridge team management as recommended by Section B-VIII/2 of the STCW 95 Code.

2005/108 Consider the fitting of an ECS system to all its vessels.

The International Chamber of Shipping is recommended to encourage its member shipping companies to:

2005/109 Ensure internal procedures are in place to verify compliance with company instructions.

2005/110 Consider cultural and social issues when appointing and training crews, so that the capability and effectiveness of the bridge team is not degraded.

2005/111 Introduce a routine of restricted use of mobile telephones in pilotage and other restricted waters.

Marine Accident Investigation Branch
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ANNEX 1

Analysis of Human Factors

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The grounding of the Attilio Ievoli – Analysis of Human Factors.

1. The nature of the errors that appear to have caused the grounding of theAttilio Ievoli has been examined with a view to judging the contribution of human factors, specifically teamwork. [1]

2. The initial human factors failure that contributed to this event was the Master's decision to take the vessel through the West Solent against his company's policy. It is relevant that, when the Master made this decision, he knew that this routing required the vessel to pass through an area of complex tides and navigational hazards without a pilot.

3. This initial error of judgement was later compounded by inadequate teamwork on the bridge. Following the departure of the pilot at 1600, the crewmembers do not appear to have been clear as to their own and others' roles and responsibilities. Task performance was not co-ordinated and there was little overt management and supervision. The ultimate consequence of this lack of responsibility management was that, at the time of the grounding, no member of the bridge team had an accurate appreciation of the ship's position.

4. In terms of teamwork best practice, it is possible to identify three areas where action should have been taken to mitigate against this state of affairs.

5. First, the Master should have prepared a plan for responsibility management during the first few sea watches. This plan should have been briefed to the officers undertaking those watches prior to sailing. The plan should have included the Master's instructions for each individual a. while the pilot was on board, b. in the period between the pilot's disembarkation and the watch handover at 1600, and c. in the period after 1600.

6. Second, a formal handover of watches should have occurred at 1600. As well as establishing a shared appreciation of the ship's situation at that point, such a handover should have been used to reiterate each crewmember's responsibilities during the watch to come, and formally to relieve officers who were going off watch.

7. Third, the Master, as officer of the watch, should have engaged in appropriate supervision during his watch. He should have communicated with the bridge team to provide feedback, to set goals and priorities, and to ensure that all team members had an appropriate and compatible understanding of the ship's situation and their own, and others', role in its management. Had this been done, it is possible that the Master would

[1] A team is defined as two or more persons with differentiated roles acting collaboratively and interdependently in pursuit of shared goals.

have been aware that the cadet, who was apparently taking positions, was merely marking the vessel's progress on the assumption that it was following the planned track.

8. The fact that the vessel was following an inappropriate course was identified by the 2/O at 1610, well in advance of the grounding. He informed the Master of this. However, the Master later claimed not to have heard.

9. There is some evidence to suggest that the Master was speaking on the telephone when the 2/O warned him that the vessel was off course. This provides a possible explanation for the master not hearing the 2/O's communication. It seems probable, given that they were co-located on the bridge, that the 2/O would have been aware that the Master was on the telephone and that this would make it difficult for him to attend to other communications. Consequently, whether or not the Master was on the telephone, it is important to consider why the 2/O did not ensure that the Master had heard him. Several possible causal factors have been identified and are discussed below.

10. Owing to the different nationalities involved – the Master was Italian and the 2/O Ukrainian – the issue of language was investigated by the inquiry. It was established that English was used as the common language on the Bridge and that, in this case, the individuals were both competent in its use.

11. Language having been discounted, it is necessary to consider social factors. It is possible to speculate that when the 2/O told the Master that he believed the vessel to be off track, he misinterpreted the fact that he did not receive a response. One explanation is that he believed that the Master had heard, but assumed that the Master felt it was appropriate not to respond.

12. The 2/O was new to the vessel, having joined only five days previously. At the time of the event, he would still have been learning about his new colleagues, adapting to the team 'climate' and forming a view as to what his role was, how he should behave, and how he should expect to be treated. Earlier, the Master had instructed him to go and lower a flag, a task that arguably would more appropriately have been given to the cadet. The 2/O may have formed the view that the Master saw him as a junior crewmember and that the lack of acknowledgement was consistent with this. Moreover, had the Master been engaged on a telephone call, and the 2/O aware of it, then, given the 2/O's likely conception of his relative status, this presents a further perceived barrier to his pressing the Master for acknowledgement.

13. Teamwork best practice emphasises the requirement to achieve 'closed-loop communication'. Thus, not having received a response, it was incumbent on the 2/O to ensure that the message had been received and understood by the Master. The 2/O's apparent reluctance to do this may have stemmed from a concern that he would irritate the Master. In effective teams, even junior members understand that if they have information that they believe to be important, they are expected to communicate it to the appropriate person. Such behaviour should be reinforced and encouraged by managers and other team members. The inquiry noted that at the time of the event, the 2/O had not received a personal briefing from the Master. As such, he was left to form his own expectations about appropriate behaviour.

14. It is possible that a cross-cultural factor contributed to the failure of this interaction. Research suggests that, on average, Eastern European cultures, such as that of the Ukraine, are higher on 'power distance' than is the Italian culture. That is, subordinates expect to show greater respect and deference to superiors and are more likely to expect to be led in the workplace. As with all cross-cultural observations, there is no suggestion

that one approach is superior to the other. Rather, the important point is that in multinational teams the potential exists for incompatibility between team members' fundamental assumptions. These incompatibilities can introduce friction and risk.

15. It is not possible to comment directly on the attitudes of the individuals involved in this case. However, the sequence of events might be explained by reluctance on the 2/O's part to be seen to question the authority or the competence of the Master by reiterating his concerns about the vessel's position. In this regard, it is notable that, on his return to the bridge, the 2/O chose to address his concerns about the vessel's position to the cadet and not to the Master directly.

16. The apparently passive actions of the 2/O are consistent with attitudes and beliefs found in higher power distance cultures and with comments made by the First Mate that Eastern European crewmembers tend to await instruction before acting. In view of this, it is quite likely that, in the period after 1600, the 2/O was unsure how to act, knowing his watch to have ended, but not having received formal instruction that he had been relieved. The First Mate also commented that, when Eastern Europeans first join an Italian vessel, they tend to be 'subdued' at first. This tendency can be explained by their requirement to 'acclimatise' both to a new working environment and to differences in national and working cultures. In this situation, they must learn how they are expected to act. In this regard, it is important to note that, not only was the 2/O new to the vessel, but that this was also his first appointment on an Italian vessel.

17. In conclusion, the Master's decision to take the vessel through relatively hazardous waters, without a pilot, and under automatic steering must be questioned. The risks inherent in this scenario were compounded by poor team management, resulting in an inappropriate division of tasks, and a lack of accurate positional awareness. The 2/O knew that the vessel was not following an appropriate course but failed to communicate this to the Master. The poor standard of teamwork accepted by the Master probably contributed to this failure. Language difficulties probably did not play a part, but cultural differences and communications practice may well have made a contribution.

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