BAHAMAS MARITIME AUTHORITY

Report of the investigation into the collision between the passenger vessel "Norwegian Dream" and the container vessel "Ever Decent" in the approaches to the Dover Strait at 0055 on 24 August, 1999

12 April, 2000

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FOREWORD

The investigation into the collision between the Bahamian cruise ship Norwegian Dream and the Panamanian container ship Ever Decent was conducted under the provisions of the Merchant Shipping Act.

The Bahamas Maritime Authority investigates incidents at sea for the purpose of discovering any lessons which may be learned with a view to preventing any repetition. It is not the purpose of the investigation to establish liability or to apportion blame, except in so far as it emerges as part of the process of investigating that incident.

It should be noted that section 170(2) of the Merchant Shipping Act requires officers of a ship involved in an accident to answer an Inspector's questions fully and truthfully. If the contents of a report were subsequently submitted as evidence in court proceedings relating to an accident this could offend the principle that a person cannot be required to give evidence against himself. The Bahamas Maritime Authority makes this report available to interested parties on the strict understanding that it will not be used as evidence in any court proceedings anywhere in the world.

ACKNOWLEDGEMENTS

The investigation was assisted by the Warsash Maritime Centre, Southampton, England, who enabled the events preceding the collision to be reconstructed on their full mission bridge simulator.

The reconstruction was made possible by using information and shore radar plots provided by the Channel Navigation Information Service (CNIS), Dover, England. It was possible to display both the radar information and the visual scene from the perspective of both of the ships involved, together with that part of the VHF discussion which was recorded at the CNIS.

Grateful acknowledgement is made to both of the above bodies.

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Chapter 1
SUMMARY

1.1 A collision between the Bahamian cruise ship Norwegian Dream and the Panamanian container ship Ever Decent occurred at 0055 British Summer Time on Tuesday 24 August 1999 in the southern North Sea. No lives were lost and no serious injuries resulted.

1.2 The accident occurred in the eastern approaches to the Dover Strait, in the south west lane of the Traffic Separation Scheme 319°, 3.2 miles from the F3 Buoy. There was heavy traffic congestion in the area which is the junction of several traffic flows. During the period before the accident both ships were restricted in their ability to take early avoiding action by other traffic in the area.

1.3 The Norwegian Dream had the Ever Decent on her starboard bow and was the give-way vessel. She did not take adequate action to avoid collision. This was partially due to the radars/ARPA's not being used to their best advantage and partially because of an overload of information at critical times during the approach to the Ever Decent.

1.4 The Ever Decent was the stand-on vessel but, apart from making a VHF call five minutes before the accident, failed to take any action to avoid collision even when it became apparent that the Norwegian Dream was not taking appropriate action.

1.5 The situation was made more difficult because of the manner in which all ships approaching the area of the F3 buoy were confined by the layout of the Traffic Separation scheme at that point. Both the Norwegian Dream and the Ever Decent were constrained from taking early action to avoid a collision by the proximity of other ships.

1.6 After the collision the captain and crew of the Norwegian Dream took all appropriate actions to ensure the safety of the ship and her passengers and to allay the concerns of the passengers. Both ships were eventually able to make port under their own power. The Norwegian Dream was underway about an hour after the collision, the Ever Decent suffered a fire in her containers on deck which delayed her entry into port for several days.

1.7 Recommendations are made on several matters including the use of radar and the organisation on board the Norwegian Dream. Research is recommended into the layout of the Traffic Separation Scheme in the area where the collision occurred and also on the management of information on a modern well-equipped ship's bridge.

Chapter 2
NARRATIVE OF EVENTS

2.1 Introduction

A collision between the Bahamian cruise ship Norwegian Dream and the Panamanian container ship Ever Decent occurred at 0055 British Summer Time on 24 August 1999 in the eastern approaches to the English Channel. The collision happened in the South West lane of the traffic separation scheme in the vicinity of the F3 Buoy (see Annexes 4 & 5). There were no deaths or serious injuries and both ships were eventually able to proceed to port under their own power. Nevertheless, there was legitimate public concern that two large, modern, well-equipped ships could collide in fair weather with good visibility. Both ships were operated by well-respected companies and were maintained and manned to full International Convention standards. The circumstances surrounding the collision therefore merited careful examination. Little is known about the intentions or actions of those on board the Ever Decent, but the actual movements of the ship are known from the shore-based radar plot.

It became apparent at an early stage of the investigation that the circumstances surrounding this collision were not straight forward. There were indications that the Officer of the Watch (OOW) on the Norwegian Dream had become confused by the information which he was receiving. This appeared to be related to the amount of information he was receiving, the way in which he was receiving it and the concentration of traffic in the vicinity of the F3 buoy. Fortunately, the movements of both the Norwegian Dream and the Ever Decent together with those of other ships in the vicinity were recorded on the shore-based radar of the Channel Navigation Information Service, Dover, England (CNIS). This allowed a rare, if not unique, opportunity to examine the incident in great detail without the usual distortions which occur to peoples' memories after such a traumatic event. It was decided to explore the possibility of transferring the information to a simulator to enable a re-enactment of the event. The Warsash Maritime Centre, Southampton, England, was commissioned to undertake this work.

All available information was entered into the full-mission simulator at the Warsash Maritime Centre. After all possible adjustments to achieve a reproduction of the original shore-based radar plot, a re-enactment of the incident was carried out with the Bahamas' accident investigators present. It was possible to run the visual scene, the radar and other data relating to the incident through in real time and to stop it and analyse various critical stages. A fuller description of the work carried out, and the limitations of the analysis, is in Annex 7.

(Except where otherwise indicated all times are British Summer Time (GMT + 1 Hour). This was ship's time aboard the Norwegian Dream.)

2.2 NORWEGIAN DREAM - Voyage from Oslo

The Norwegian Dream sailed from Oslo at 1500 Local Time on Sunday 22 August, 1999 bound for Dover with 1,750 passengers and 638 crew on board. Dover was to be the final port of call for the cruise, the scheduled time of arrival at Dover pilot station being 0400 on Tuesday 24 August.

The voyage from Oslo was uneventful until the shortly before 0100 on Tuesday 24 August. Throughout the passage the bridge was manned by one officer of the watch (OOW) and a lookout, with visits by the captain and staff captain from time to time. The captain last visited the bridge before the accident during the 1600 to 2000 watch on 23 August and the staff captain's final visit to the bridge was at 2000. The captain left no specific written night orders, apart from his standing orders. The staff captain left verbal instructions with the then OOW about when he was to be called before boarding the pilot. When the watch was changed at midnight, the OOW handing over reminded his relief of the procedure for calling the captain and told him of the staff captain's instructions.

At 2230 on 23 August speed through the water was reduced from about 19 knots to about 16 to 17 knots, on the OOW's initiative to ensure arrival at the Dover pilot on schedule. It was normal for the OOW to vary the speed in order to adjust the ship's time of arrival. At that time the ship was steering 220° True (T) and Gyro (G), having altered from 183° (T) and (G) at 2208 to join the South West bound lane of the Dover Strait Traffic Separation Scheme (TSS). The ship's position was taken at intervals from the Global Positioning System (GPS). The weather throughout this watch and the next was fair, with visibility of about 8 to 10 miles and a force 3, easterly wind. It was estimated by the OOW that there was a 2 – 2½ knot adverse tidal stream running giving a speed over the ground of about 14½ knots.

Traffic in the vicinity was monitored on two of the three radars (port and centre) - one on 10 cm, one on 3 cm - both of which were fitted with ARPA (See Annex 2). The third radar was operational but not in use. The radars were being operated in true-north-up, relative-motion mode, with the own-ship's position off-centred. The course input for the radar and its integrated ARPA display was from the gyro compass. The speed input for the ARPA was set manually, as there was some doubt about the performance of the doppler log. The input speed was 14 ½ knots, which was the estimated speed over the ground. No pre-set warning guard rings were set on either radar. The movements of other ships were predicted using the true course and speed vectors as displayed on the ARPA.

The following part of the narrative benefits from the reconstruction as well as the usual evidence resulting from statements from those involved on the Norwegian Dream, data recorded on board the Norwegian Dream and in the Channel Navigation Information Service in Dover. The pictures are from the reconstruction. On each page are two pictures which represent the situation at the quoted time. The upper is from the 'Birds Eye View' monitor, and is in effect the relative-motion radar scene from the Norwegian Dream showing the relative vectors of the surrounding ships. The lines marking the boundaries of the separation lanes are shown on this display. The lower is the synthetic radar picture displaying the relative-motion radar scene from the Norwegian Dream and showing the true

vectors of surrounding ships. For clarity, the narrative follows the re-constructed radar pictures from the perspective of the Norwegian Dream. The situation from the Ever Decent can be seen in Annex 7.

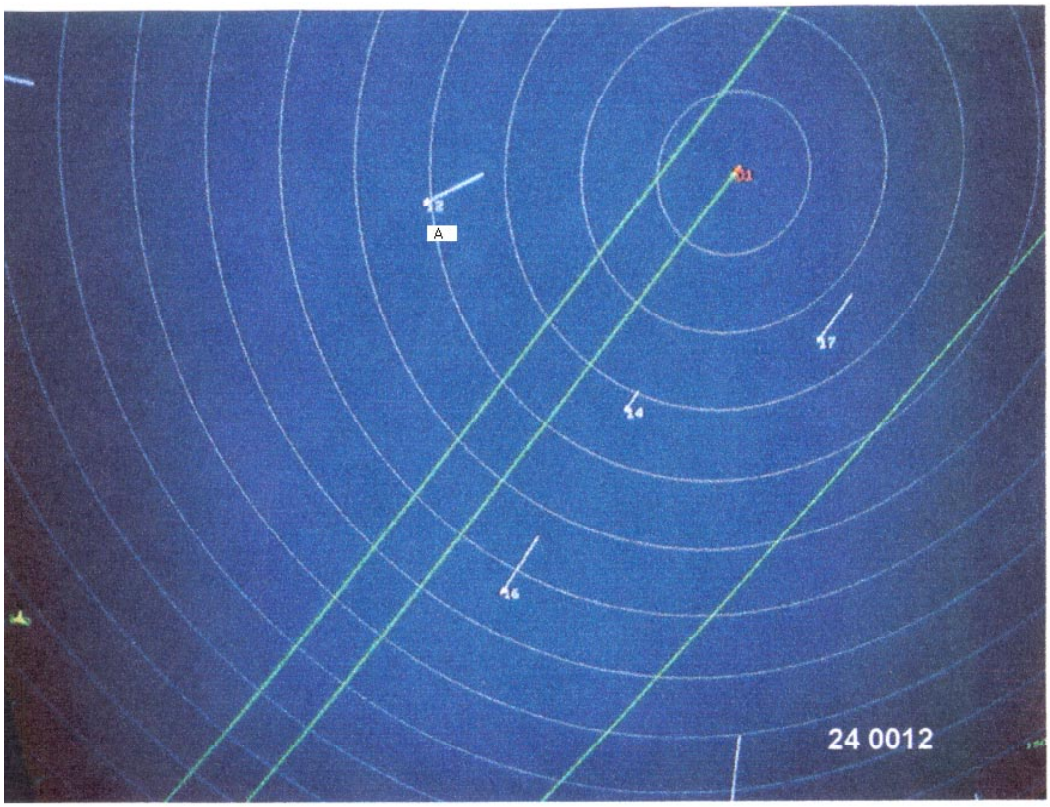
When the watch was handed over at midnight, there were at least five ships forward of the Norwegian Dream's beam steaming in the same direction. The 2000 to 2400 OOW left the bridge at about 0010.

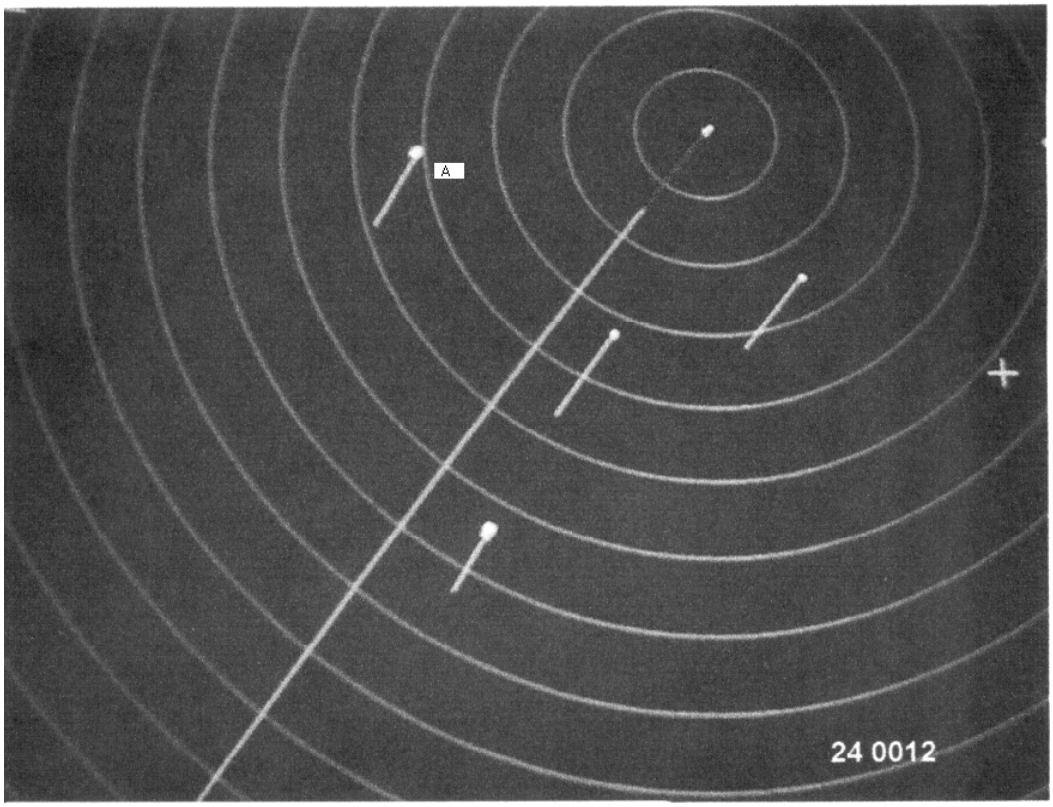
Time: 0012
(see opposite)

The traffic situation at this time can be seen in the pictures opposite. The OOW recalls that there was a further ship on the starboard quarter which had already been overtaken. There were no crossing vessels apparent visually or on either radar, which were being switched from time to time between the 6 and 12 miles ranges. All of the ships ahead were travelling in the same direction as, and were all being overtaken by, the Norwegian Dream. The ship four points to starboard (A) at a distance of 4.1 miles was the only ship which played a significant part in the main sequence of events.

Relative motion – 6 mile range – 1 mile rings
Relative 9 minute vectors

Bird's eye view - BEV





Relative motion - 6 mile range - 1 mile rings
True vectors with manual 14.5 kts speed input

Synthetic radar picture

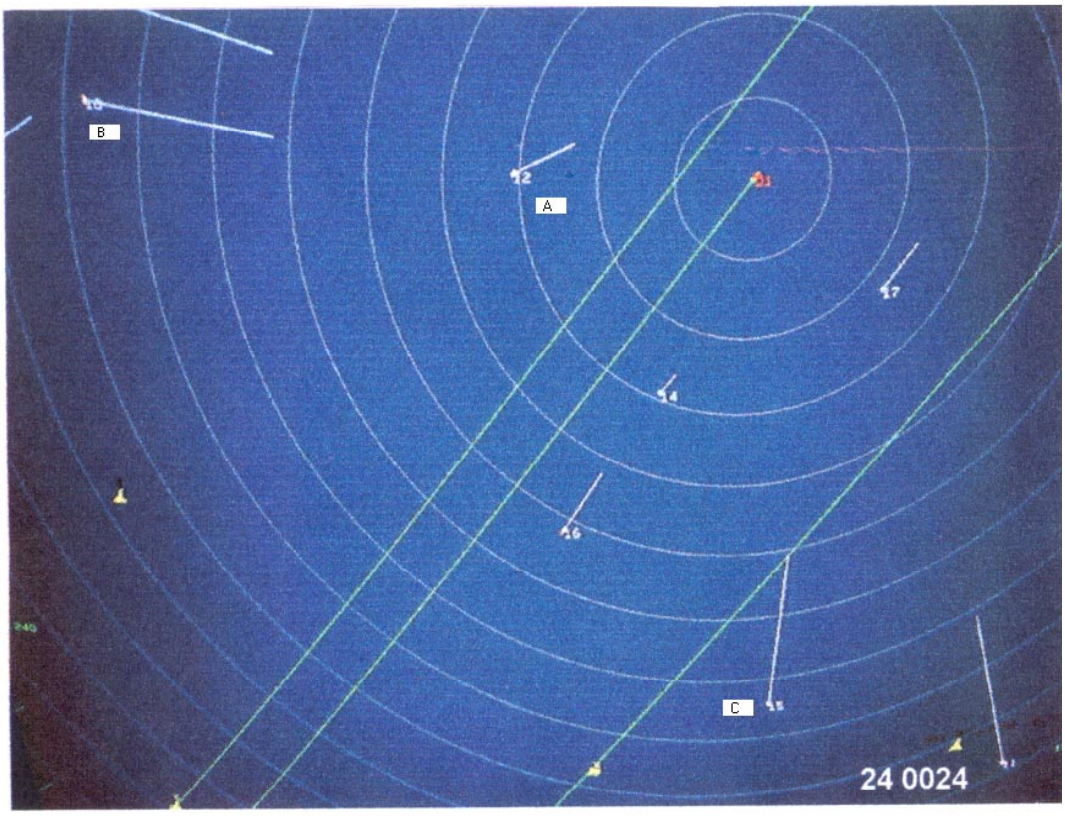
Time: 0024
(see opposite)

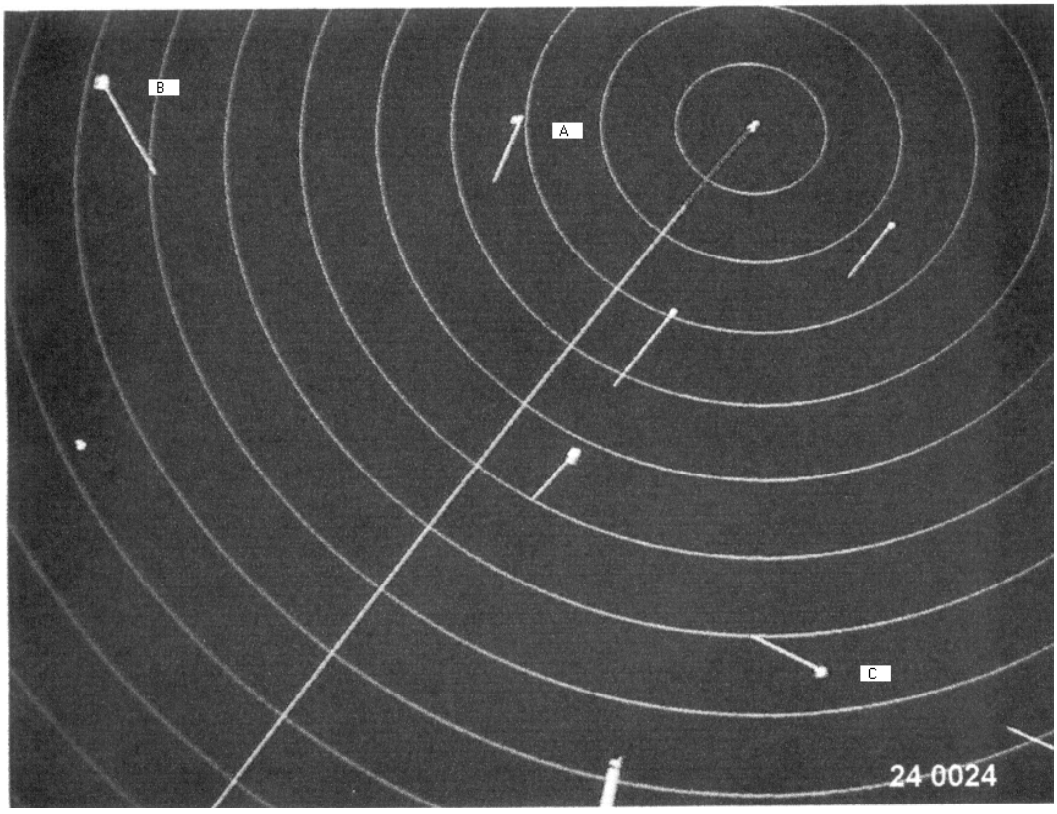
One ship was abeam to port at about 2.5 miles and no longer of concern. The ship being overtaken to starboard (A) was now about four points on the bow at about three miles, it was converging slowly but going clear. The remaining ships being overtaken presented no short term problems. A fresh target was sighted visually and by radar about four points to starboard at about 8.7 miles (B). This ship, which as can be seen later was being overtaken by Ever Decent, was crossing and had a Closest Position of Approach (CPA) of about 0.8 miles ahead. Two further targets were sighted to port, one about three points at 7.5 miles (C), the other about four points at ten miles. It is doubtful if the latter target was seen visually at this time and it plays little part in the main events, but the former target (C) was to play a significant role in the actions of the Norwegian Dream.

The racon on the F3 buoy was now on the screen about two points on the port bow at 8.8 miles.

At 0026, course was altered to 212 °(T) and (G) to bring the Norwegian Dream nearer to the centre of the traffic lane. This had the effect of bringing the CPA of the ship (B) being overtaken by the Ever Decent down to about 0.3 miles. It also brought the ship about three points to port some 7 miles away (C) onto a collision course.

Relative motion – 6 mile range – 1 mile rings
Relative 9 minute vectors



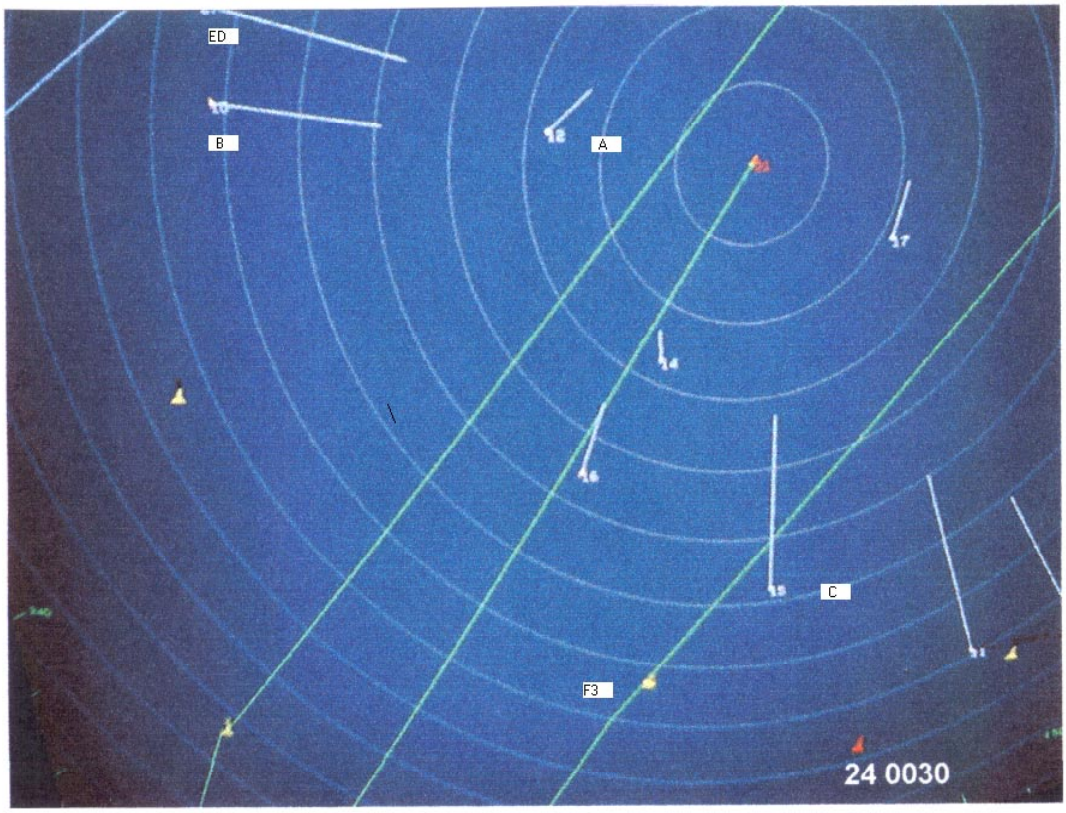


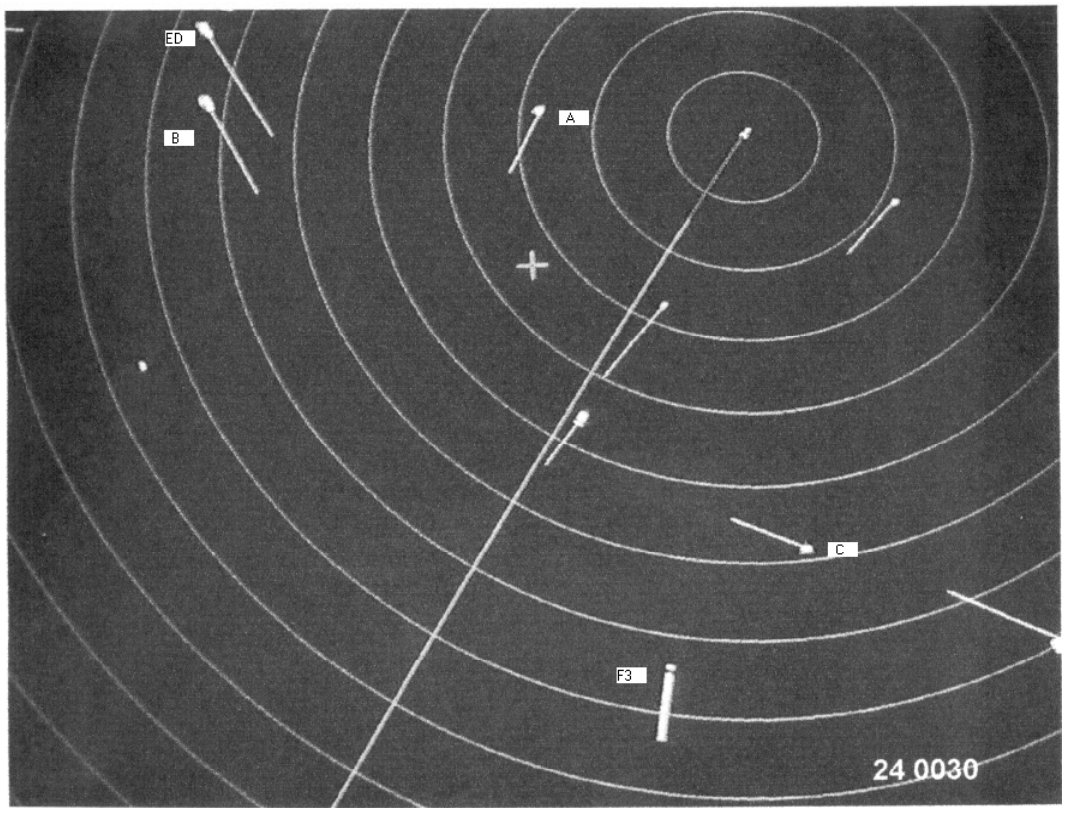
Relative motion – 6 mile range – 1 mile rings
True vectors with manual 14.5kts speed input

Time: 0030
(see opposite)

The Ever Decent (ED) came into radar view about one mile on the port quarter of the ship which she was overtaking (B). She was on a collision course with the Norwegian Dream and about 6.6 miles away. The ship being overtaken by the Norwegian Dream to starboard (A) was almost in transit with the Ever Decent and was about 2.7 miles away. The ship on a collision course to port (C) was about 5.8 miles away holding a steady course. The Norwegian Dream was under an obligation under Rule 13 of the Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREGS Rule 13) to keep out of the way of the ship being overtaken (A) and to maintain her course and speed for the ship (C) on a collision course to port. The Ever Decent was under an obligation (COLREGS Rule 13) to keep out of the way of the ship (B) which she was overtaking.

Relative motion – 6 mile range – 1 mile rings
Relative 9 minute vectors



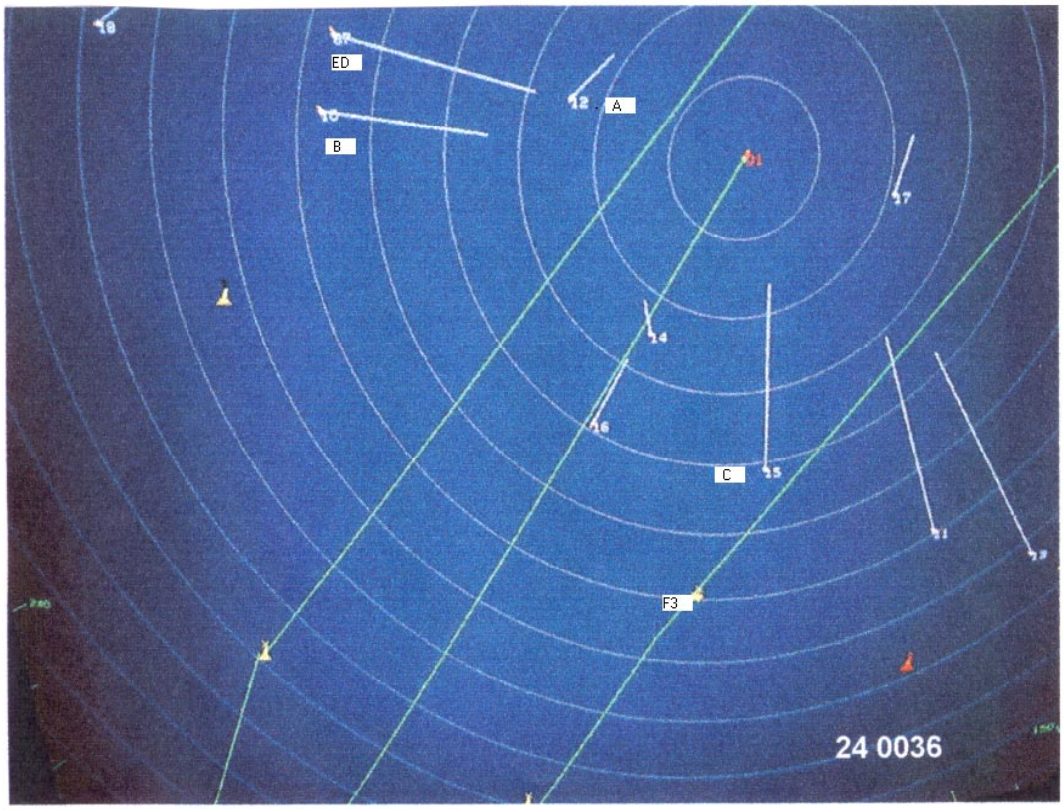


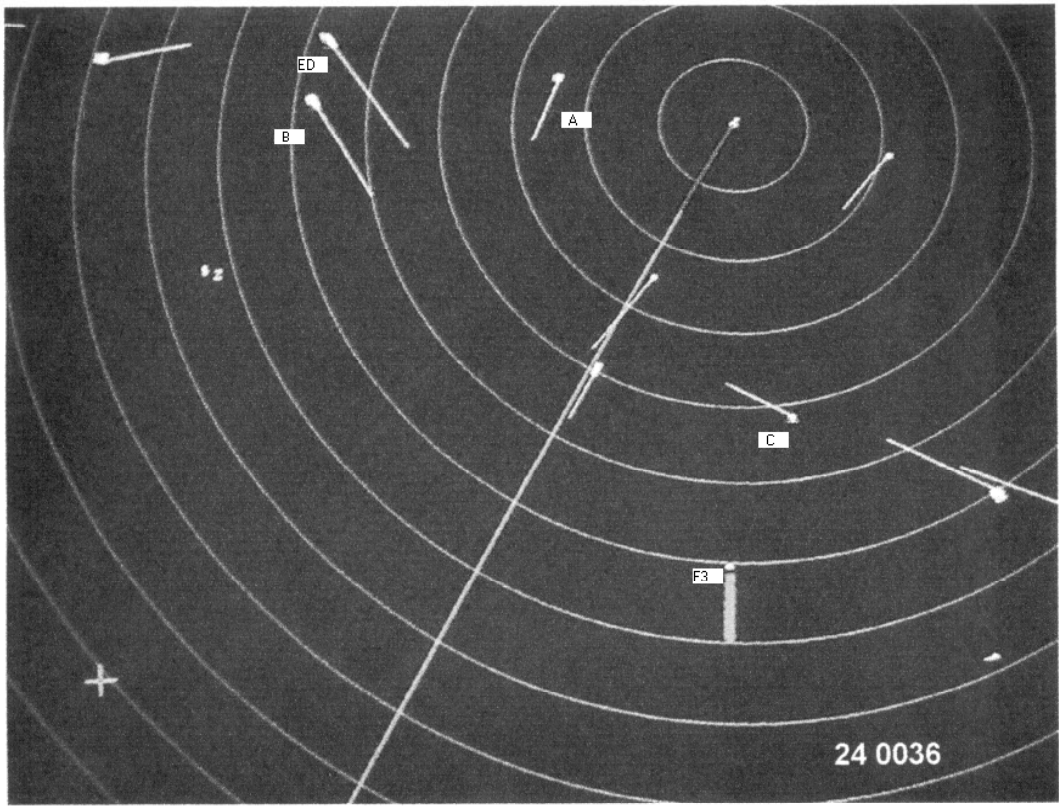
Relative motion – 6 mile range – 1 mile rings
True vectors with manual 14.5 kts speed input

Time: 0036
(see opposite)

The racon of the F3 buoy can be seen about two points to port, six miles distant. The OOW of the Norwegian Dream was conscious that as his ship passed that point it would be necessary, in accordance with company instructions to report to the CNIS station at Dover. The ship to port (C) remained on a collision course at a distance of 4.0 miles. The ship being overtaken to starboard (A) was still forward of the beam at 2.3 miles. The Ever Decent (ED) remained on a collision course at a distance of 5.5 miles, while continuing to overtake the ship on her starboard side (B). The Ever Decent (ED) and the ship being overtaken by the Norwegian Dream to starboard (A) were in transit at about this time and the Ever Decent may not have been visible to the Norwegian Dream or the lights of the two ships in transit may have been confusing from Norwegian Dream's bridge.

Relative motion – 6 mile range – 1 mile rings
Relative 9 minute vectors





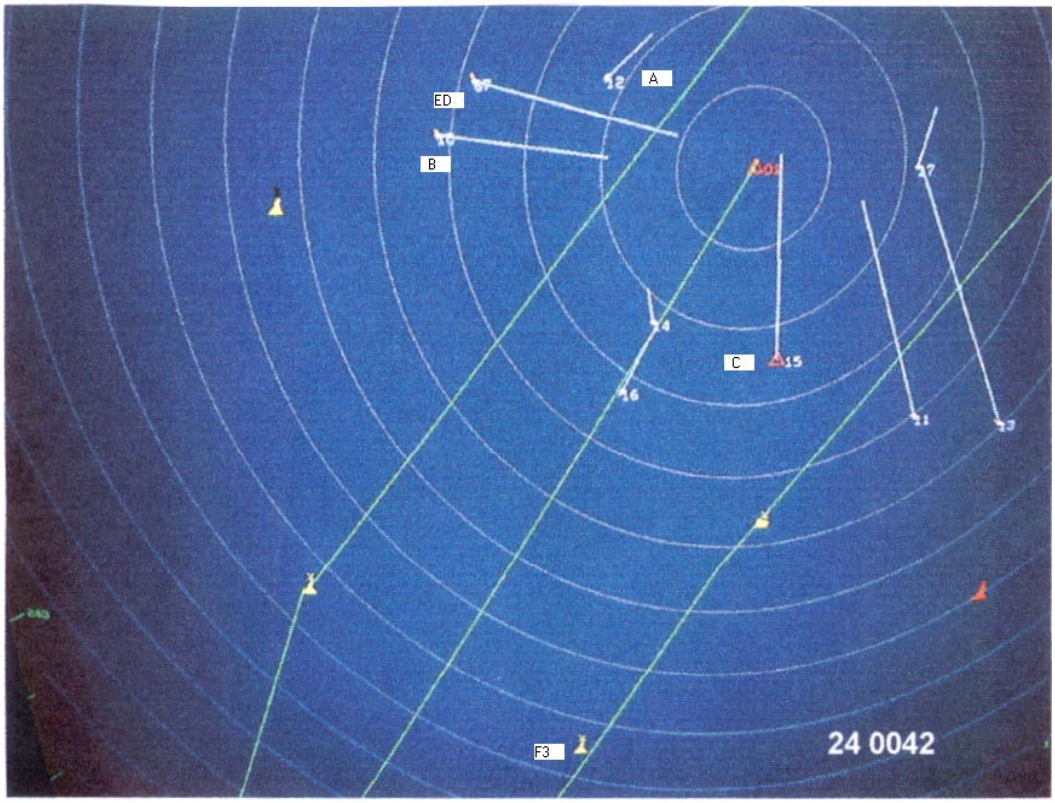
Relative motion - 6 mile range - 1 mile rings
True vectors with manual 14.5 kts speed input

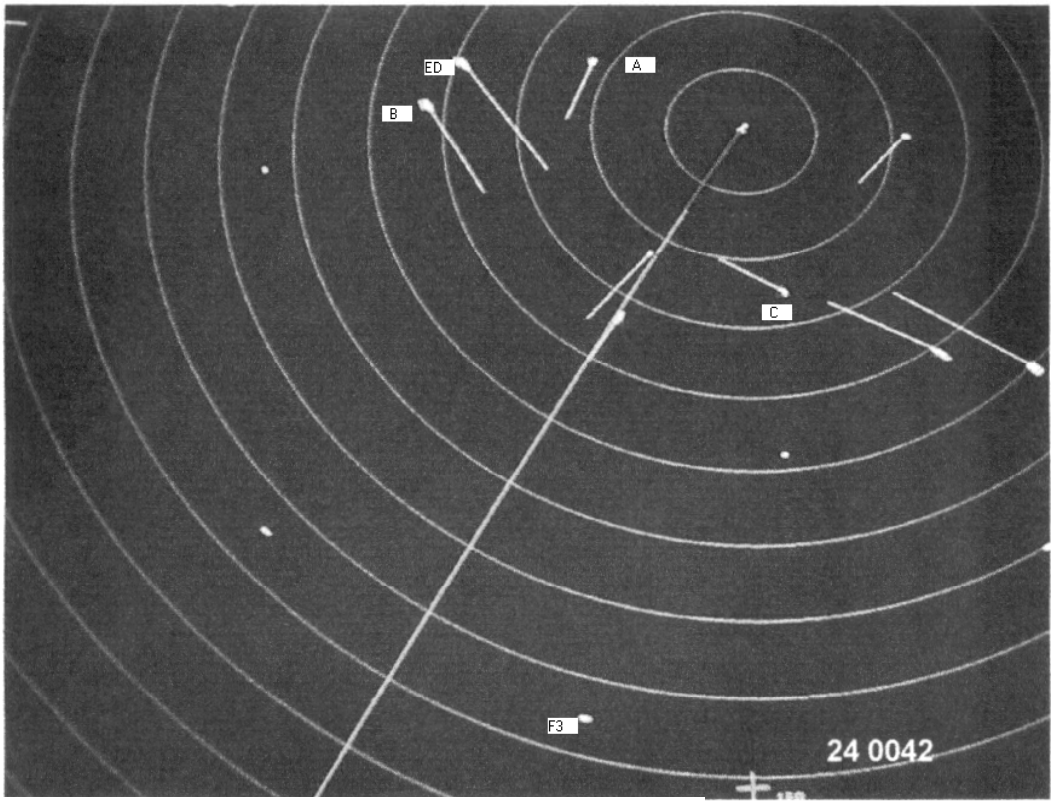
Time: 0042
(see opposite)

At about this time the ship (C) on a collision course to port, which was 2.5 miles away, altered course to starboard to pass clear of the Norwegian Dream's stern. However, if the Norwegian Dream had wished to alter to port, to parallel the Ever Decent's course, this would still not have been possible as it would have brought her into a close quarters situation with several of the ships to port including the one which had just altered course (C). The Ever Decent (ED) remained on a collision course at 3.7 miles; she still had the ship which she was overtaking (B) forward of her beam less than a mile away. This would have limited any early action to avoid the Norwegian Dream. The ship which the Norwegian Dream was overtaking (A) was still slightly forward of the beam, 2.2 miles away, still inhibiting any large alteration of course to starboard.

Just before this time, a crew member came to the bridge to have the garbage record book signed. The entrance door to the bridge was locked, as was usual for security reasons, but the OOW let him on to the bridge and signed the book. The time against the signature was 0040 and the OOW estimates that the complete operation took about three minutes. This was a distraction for the OOW at a time when the traffic situation was becoming very busy.

Relative motion – 6 mile range – 1 mile rings
Relative 9 minute vectors



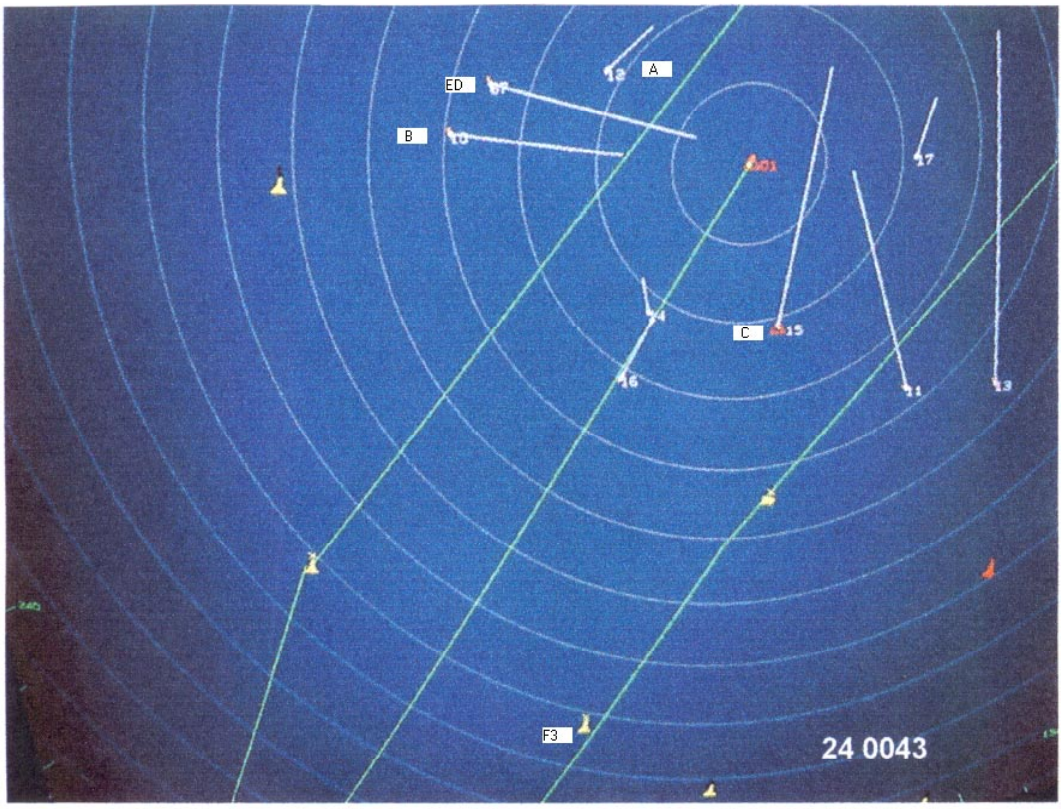


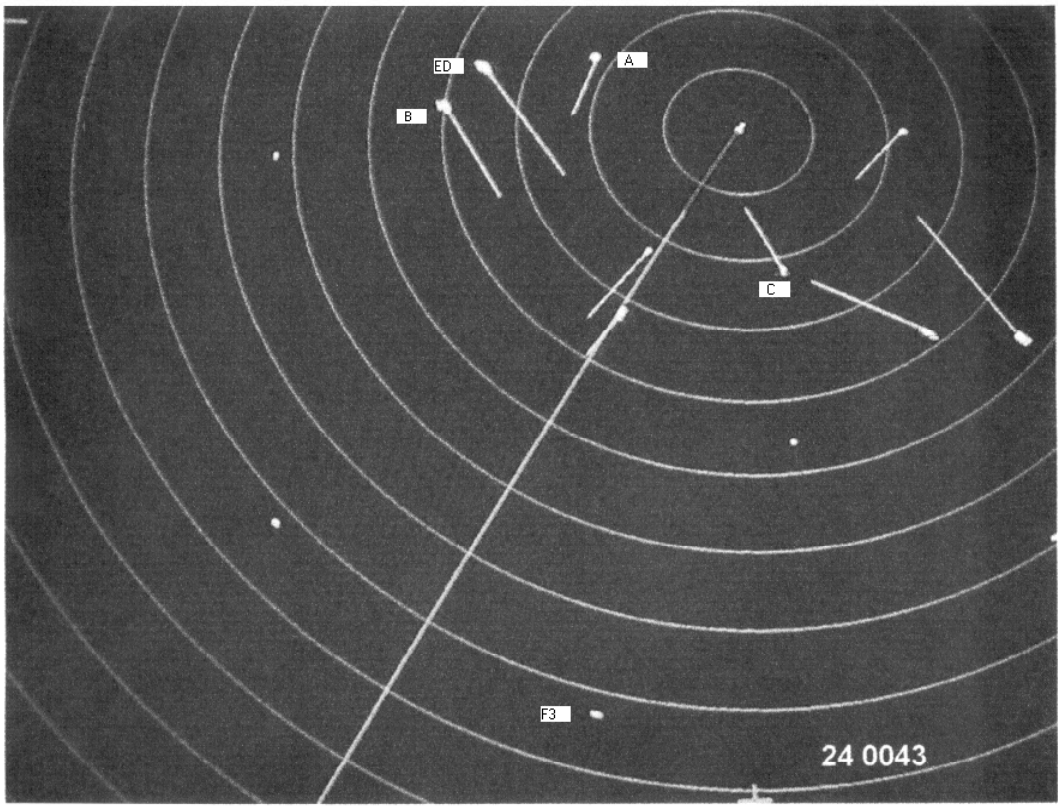
Relative motion – 6 mile range – 1 mile rings
True vectors with manual 14.5 kts speed input

Time: 0043
(see opposite)

The alteration of course by the ship to port (C) is now clear.

Relative motion – 6 mile range – 1 mile rings
Relative 9 minute vectors



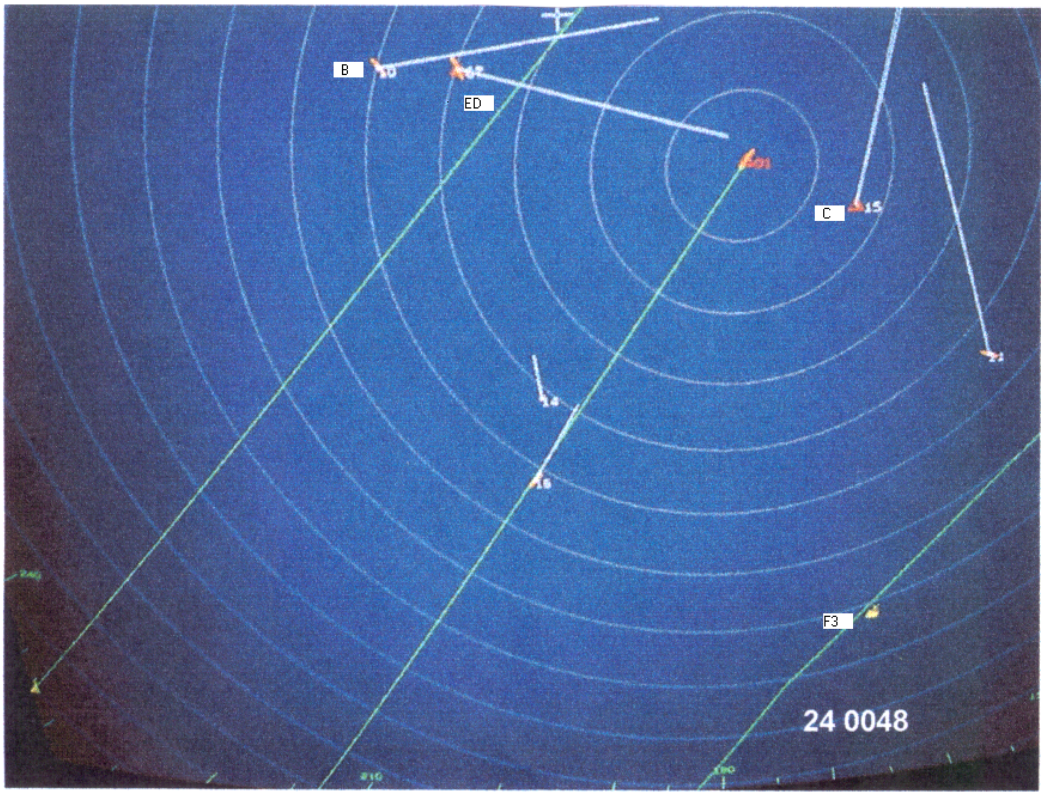


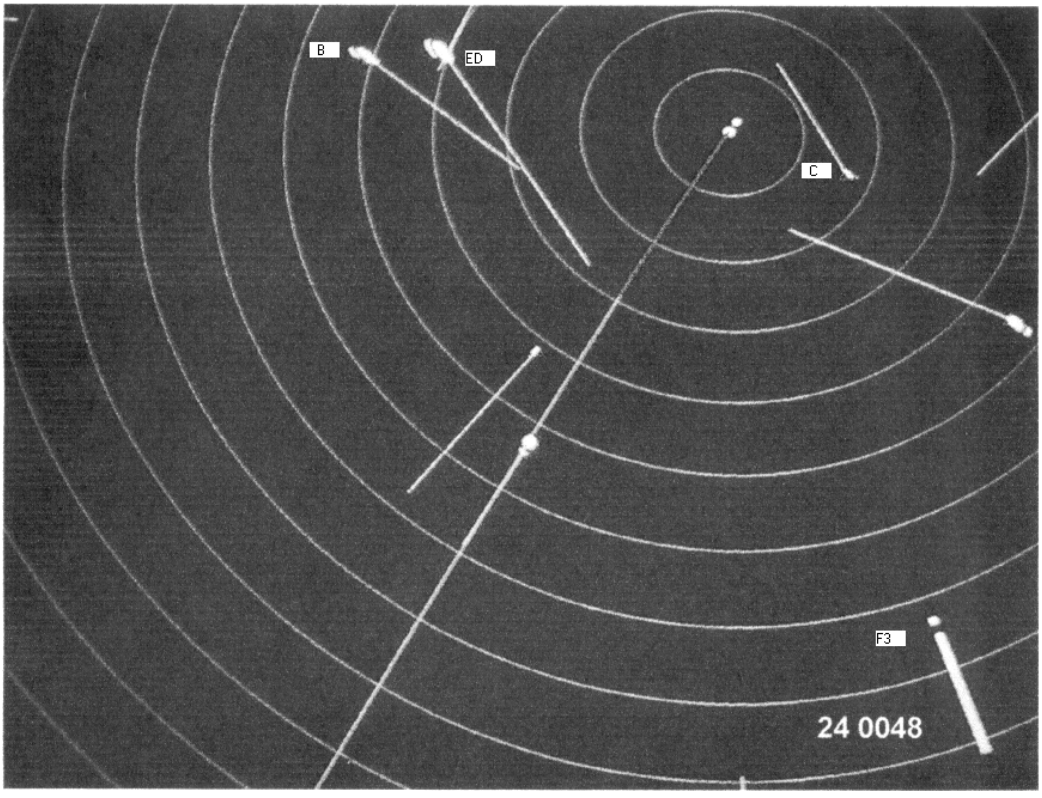
Relative motion - 6 mile range - 1 mile rings
True vectors with manual 14.5 kts speed input

Time: 0048
(see opposite)

Ever Decent (ED) was now clear of the ship which she was overtaking (B). The overtaken ship (B) altered course to port to pass around Ever Decent's stern, but at about this time the ship was in transit with the Ever Decent (ED) and probably not visible from the Norwegian Dream. The Ever Decent (ED) was 2.0 miles away and a point forward of the beam. The ship (A) to starboard being overtaken by the Norwegian Dream was now abaft the beam and no longer a direct problem, but if the Norwegian Dream had made a large alteration of course to starboard it may have brought her into a close quarters situation with this ship.

Relative motion - 3 mile range - 0.5 mile rings
Relative 6 minute vectors





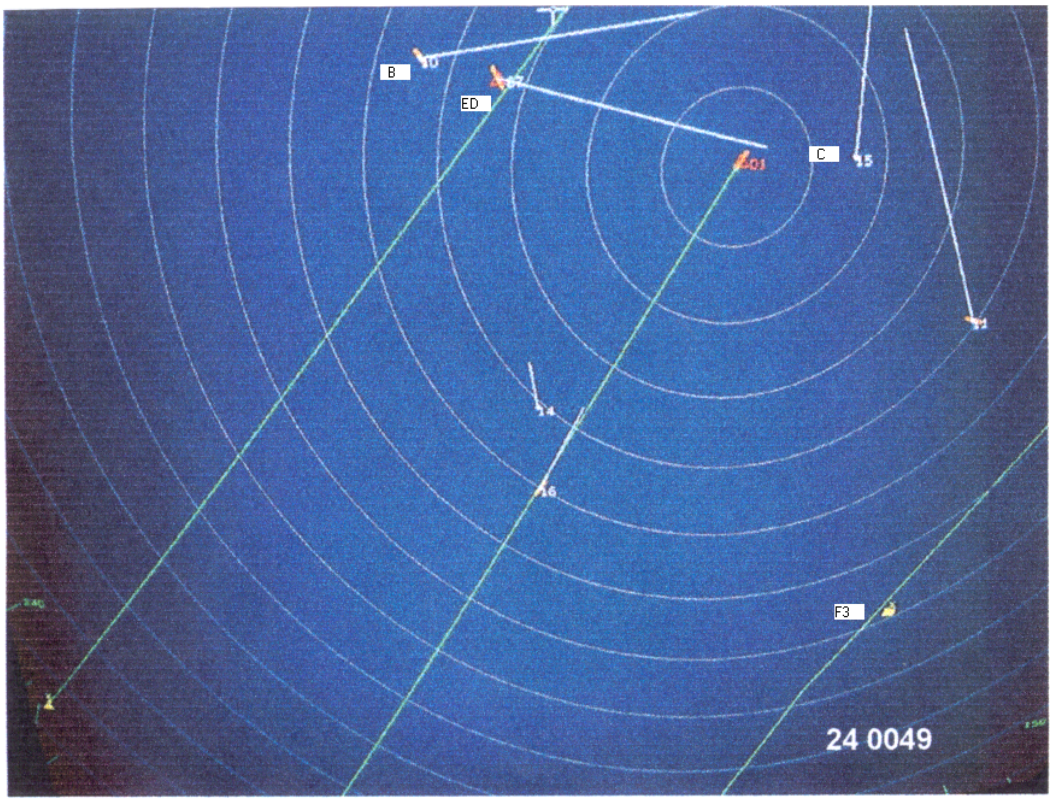
Relative motion - 3 mile range - 0.5 nm rings
True vectors with manual 14.5 kts speed input

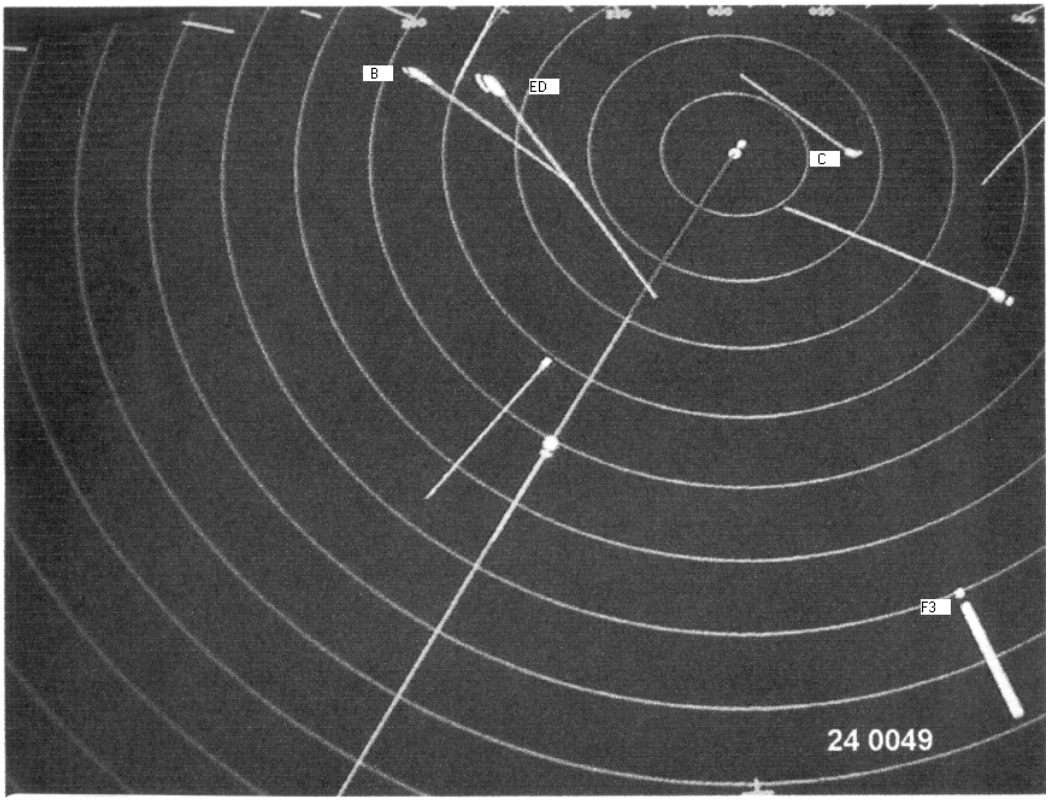
Time: 0049
(see opposite)

The Ever Decent (ED) was about 1.8 miles away, one point forward of the beam. The transit situation with (B) can be seen more clearly, it lasted until about 0051.

A message was heard on VHF, Channel 16, saying "Passenger ship approaching Foxtrot Freeboy [i.e. F3 Buoy] course 215, please". The VHF transcript from CNIS notes the first Channel 16 VHF exchange without any time but the follow up on Channel 10 was noted as 00 hours 49 minutes 40 seconds. This was about 4 - 5 minutes before the collision. The ships identified themselves and, while replying, the OOW looked to starboard and saw a ship flashing a light forward of his starboard beam. The Ever Decent asked the Norwegian Dream to come to starboard to pass around her stern. The OOW seems at this point to have become confused with the ARPA plot. He stated that he thought the Ever Decent would pass about 0.6 miles ahead of him. This probably resulted from confusing the true vector with the relative vector. As can be seen on the 0051 lower plot the true vector of the Ever Decent passes about 0.7 miles ahead of the Norwegian Dream. He therefore agreed to the Ever Decent's request. Accordingly at about 0051 he altered course about 7 degrees to starboard to 220^{o} (T) and (G) to increase the apparent passing distance.

Relative motion - 3 mile range - 0.5 mile rings
Relative 6 minute vectors





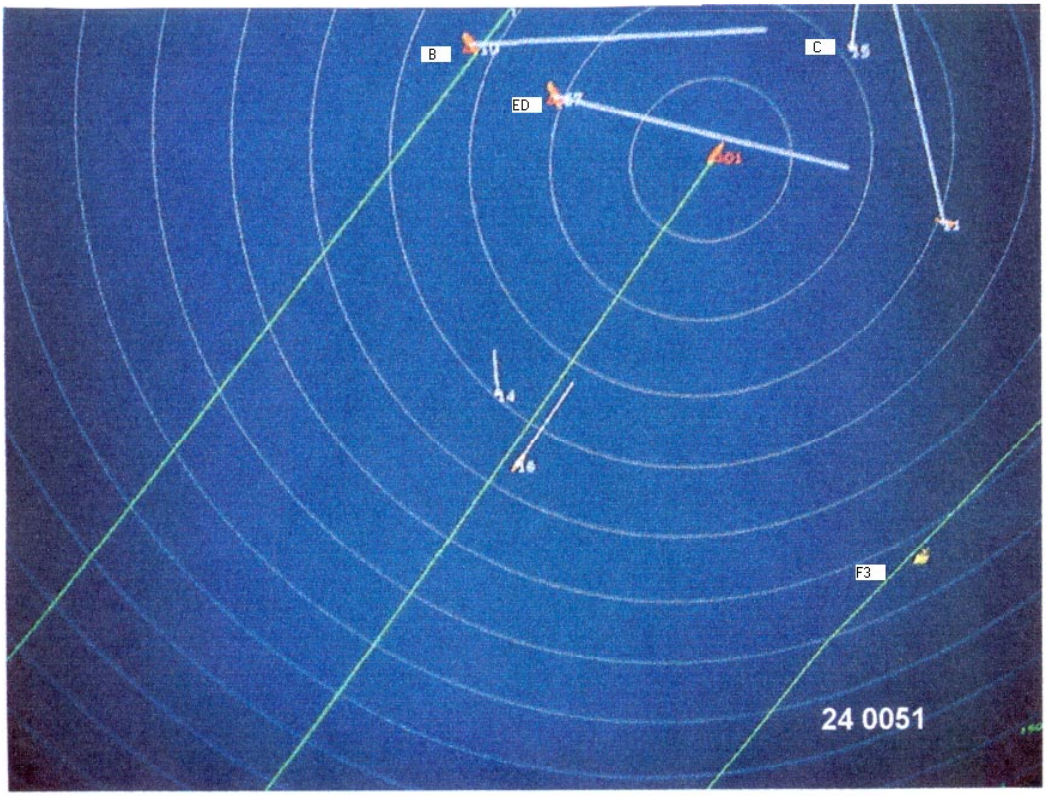
Relative motion - 3 mile range - 0.5 nm rings
True vectors with manual 14.5 kts speed input

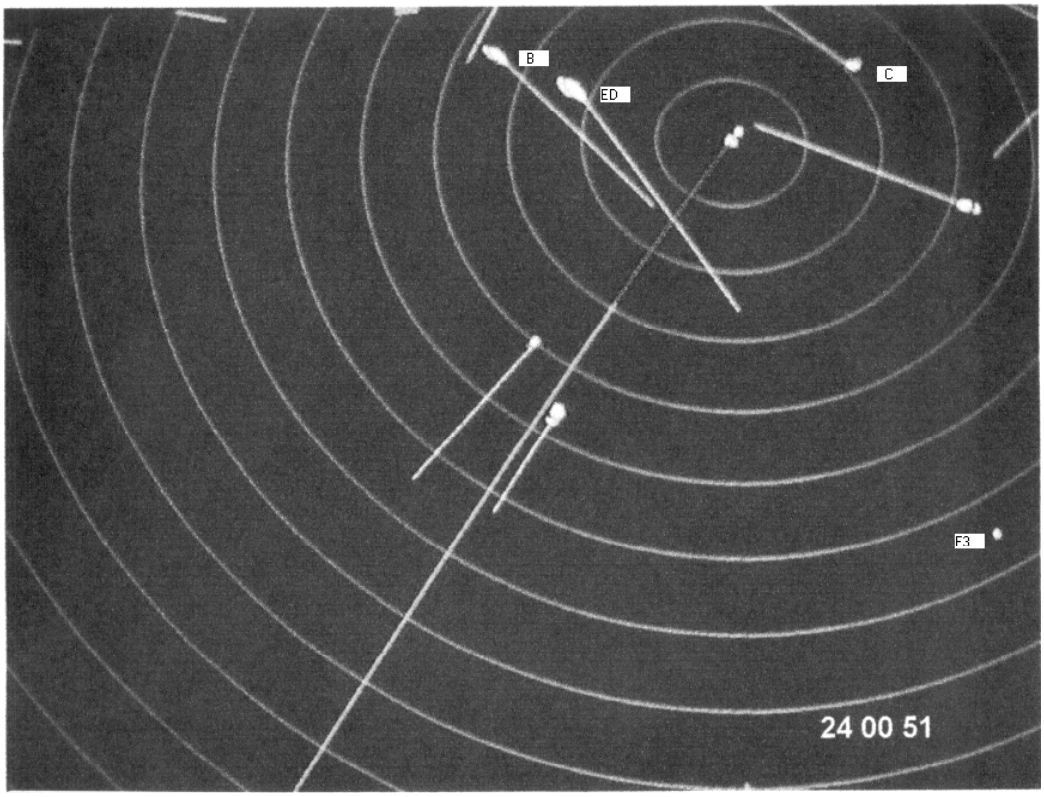
Time: 0051 (see opposite)

The Ever Decent (ED) was just over 1.0 miles away, just forward of the beam. The Norwegian Dream never steadied on to the new course of 220°. The OOW realised that the two ships were very close and that rapid action was needed. The OOW put the engine combinators (i.e. bridge controls of main propellers) to full astern and the helm hard to starboard.

The Ever Decent (ED) appears to have maintained her course and speed throughout. The plot of her track shows no deviation. If any action was taken, it was too late to affect the outcome.

Relative motion – 3 mile range – 0.5 mile rings
Relative 6 minute vectors





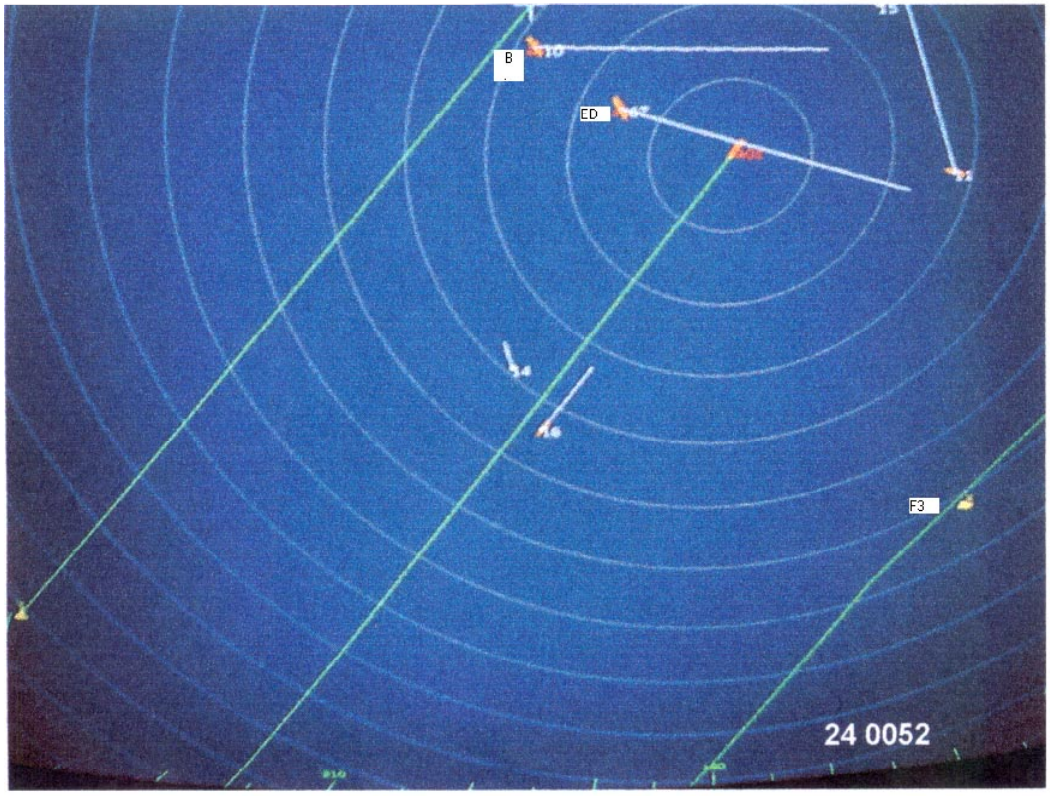
Relative motion – 3 mile range – 0.5 nm rings
True vectors with manual 14.5 kts speed input

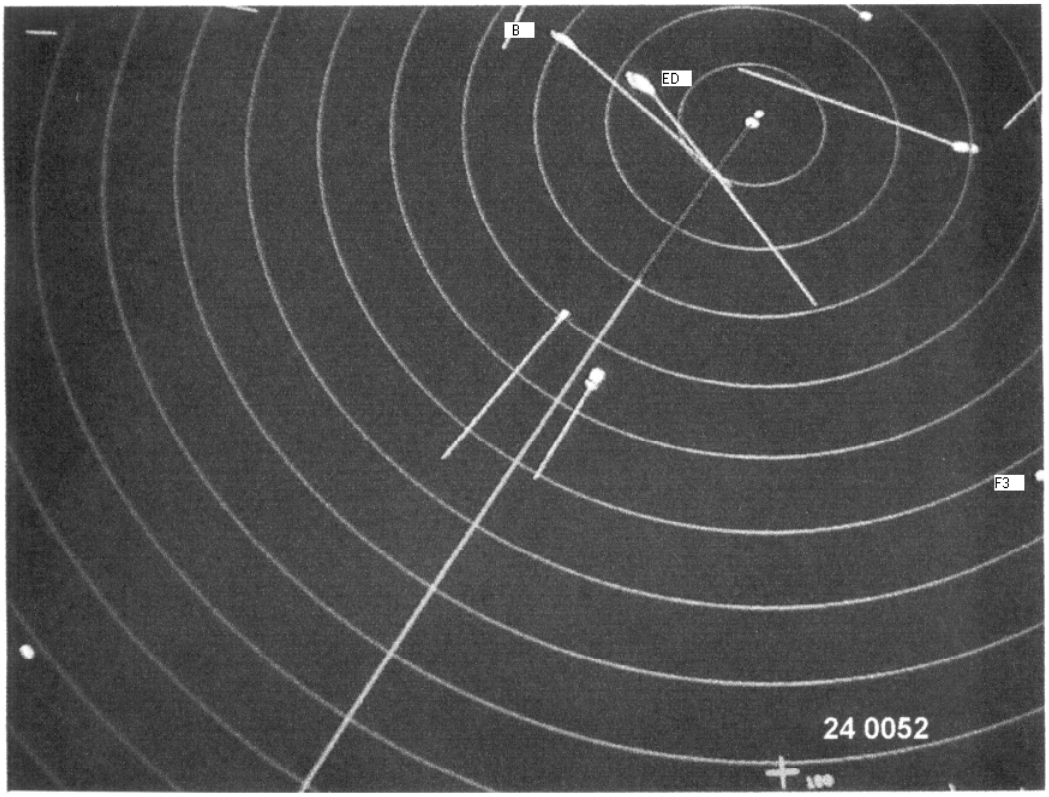
Time: 0052 to 0053

(see opposite and on pages 26 and 27)

The Norwegian Dream was swinging to starboard, but the engine movement was ineffective in reducing the vessel's speed.

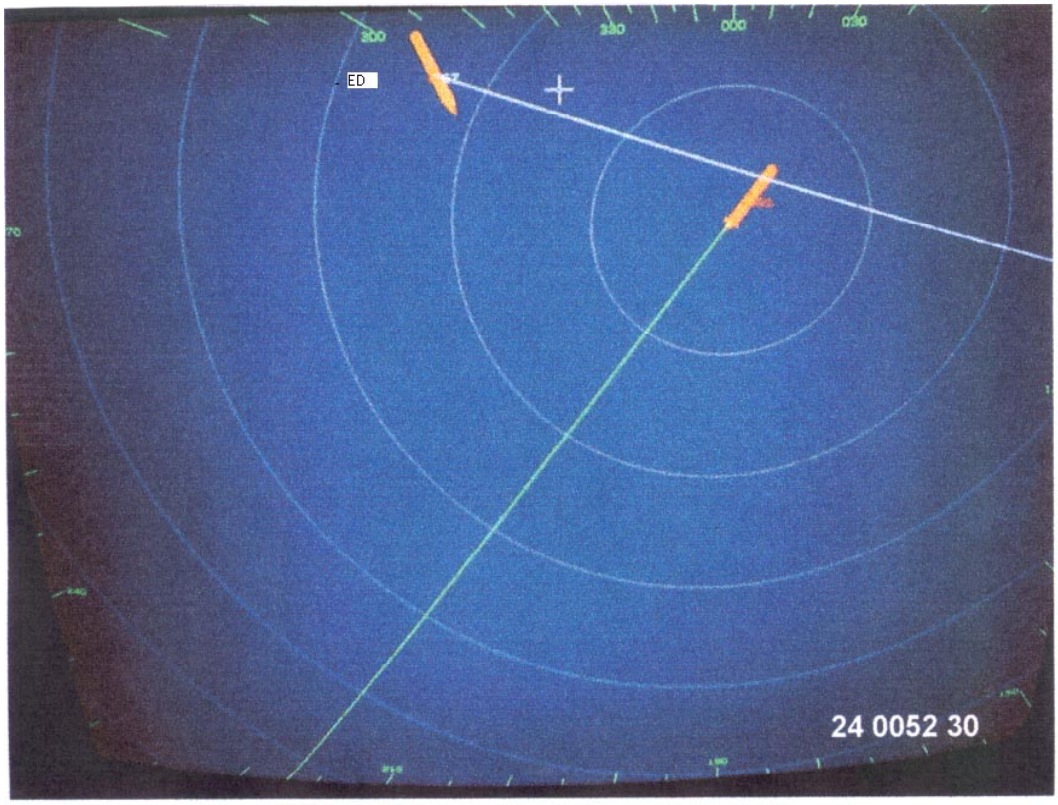
Relative motion - 3 mile range – 0.5 mile rings
Relative 6 minute vectors

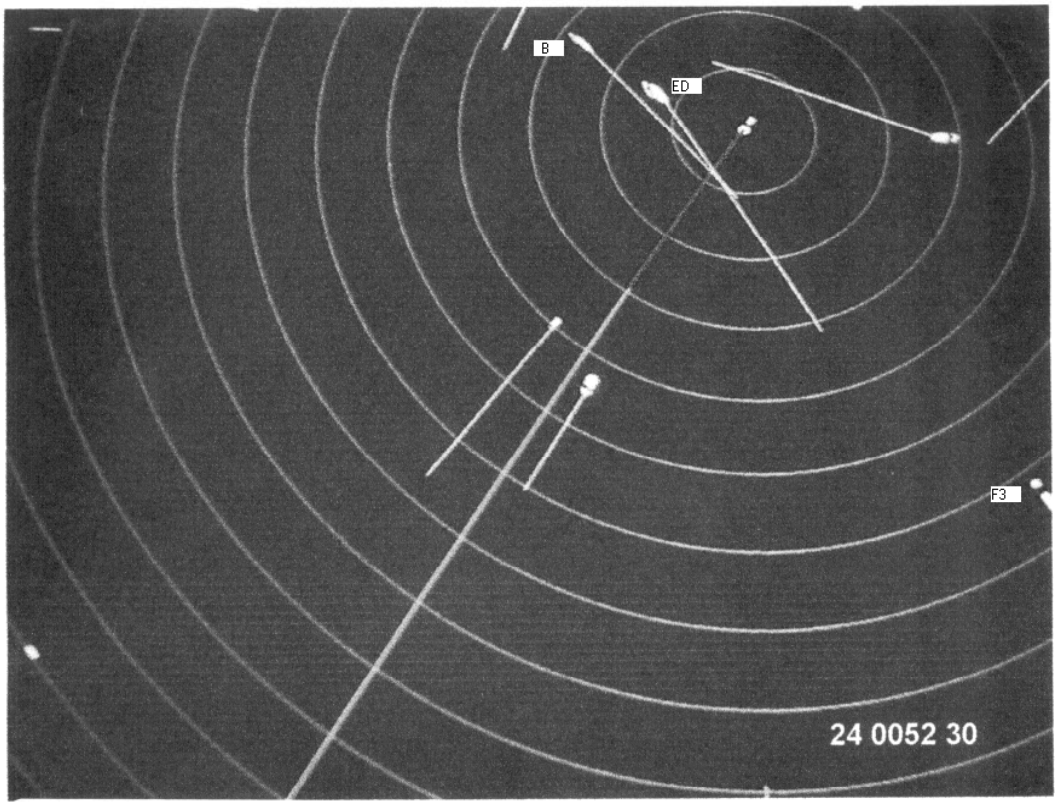




Relative motion – 3 mile range – 0.5 nm rings
True vectors with manual 14.5 kts speed input

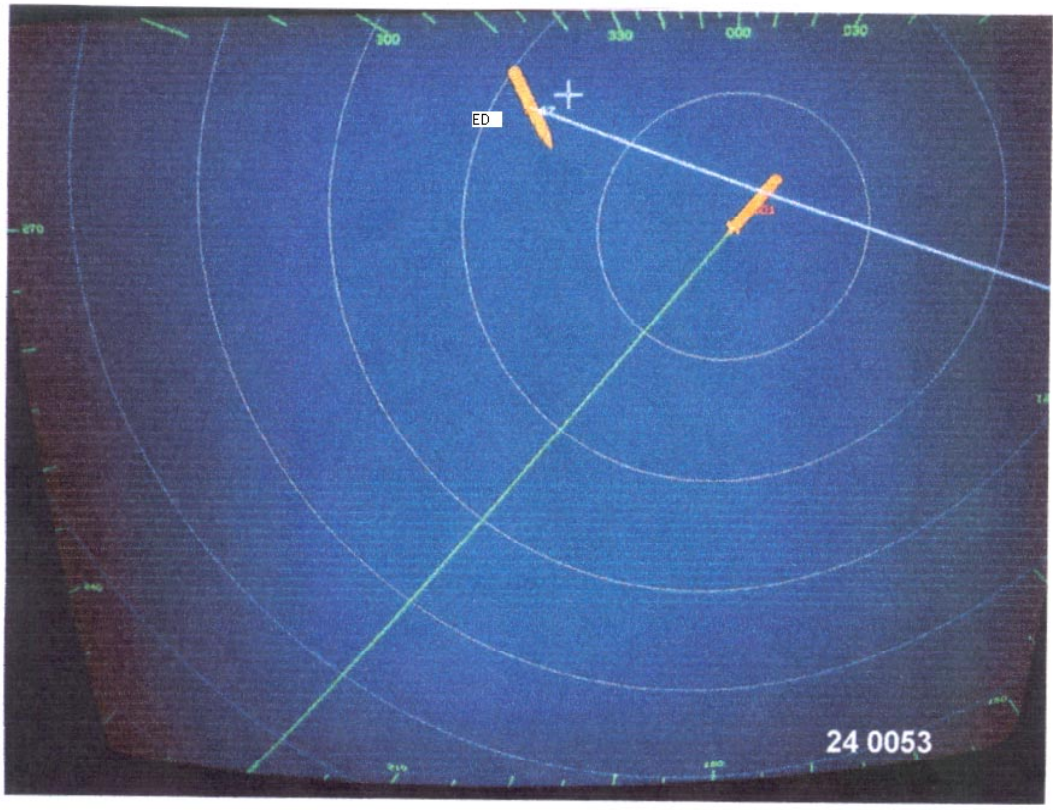
Relative motion – 0.75 mile range – 0.25 mile rings
Relative 6 minute vectors

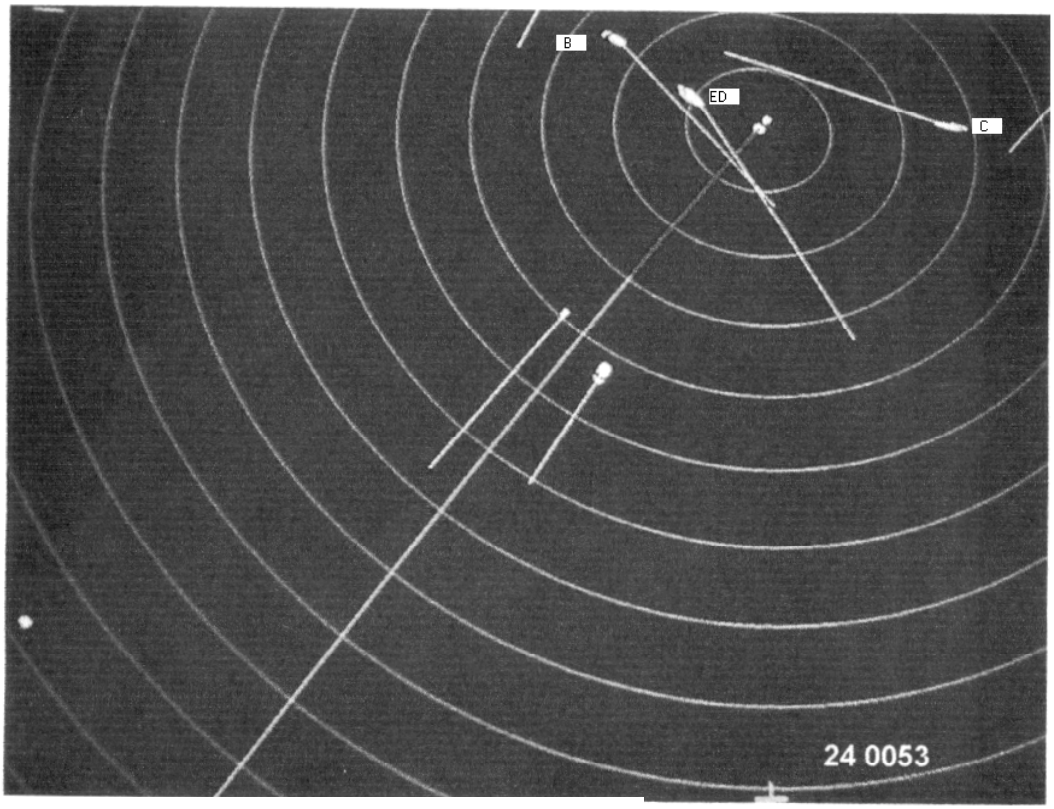




Relative motion – 3 mile range – 0.5 nm rings
True vectors with manual 14.5 kts speed input

Relative motion – 0.75 mile range – 0.25 mile rings
Relative 6 minute vectors





Relative motion – 3 mile range – 0.5 nm rings
True vectors with manual 14.5 kts speed input

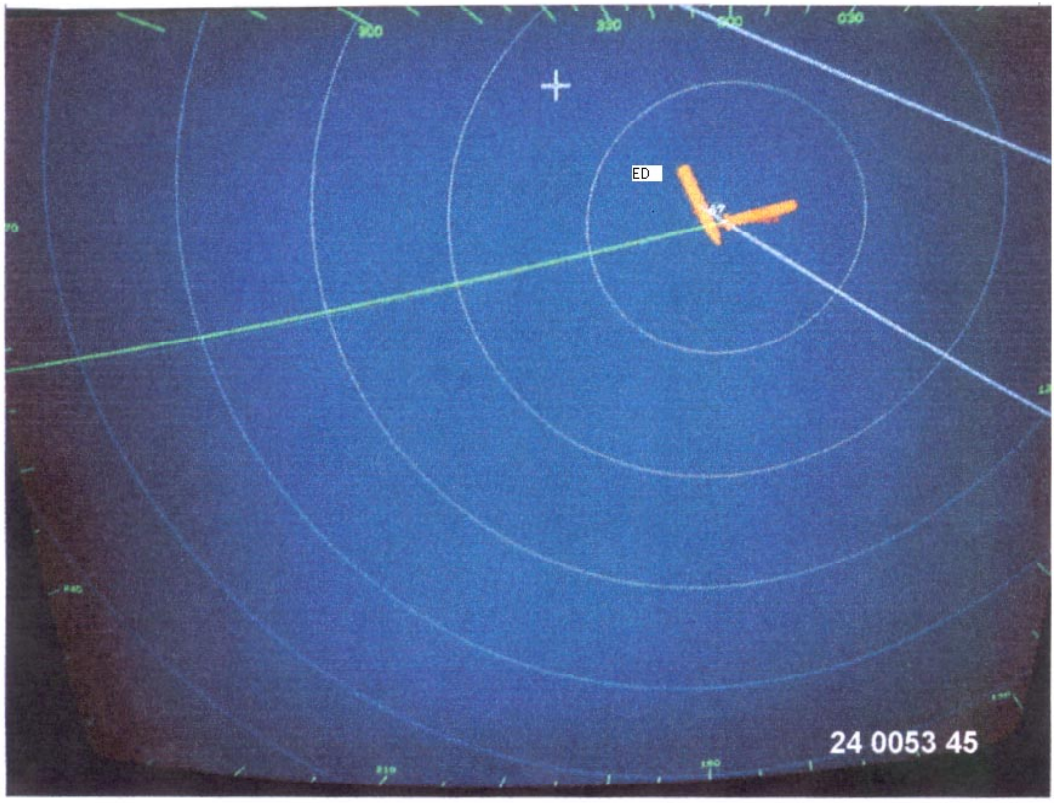
Time: 0054
(see opposite)

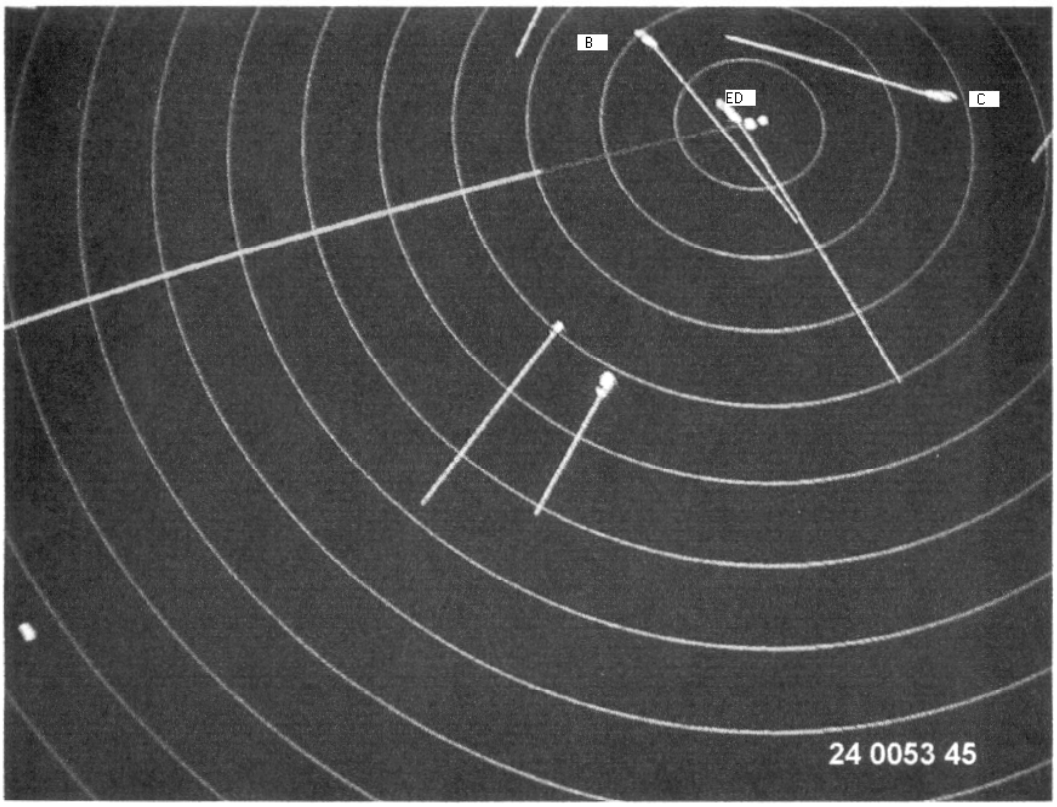
The Norwegian Dream hit the port side of the Ever Decent (ED) approximately at right angles. The pitch and revolutions of both Norwegian Dream propellers tripped to zero on impact. The momentum of the two ships swung the Norwegian Dream to port and as the ships separated the stern of the Ever Decent hit the starboard side of the Norwegian Dream causing some further damage.

The Dover Coastguard recording of VHF Channel 16 timed an unidentified call: 'Starboard, starboard, starboard' at 00 hours 54 minutes 37 seconds. It is likely that this was made by one of the two vessels immediately before the collision.

At the time of the collision the two ships were 319°, 3.2 miles from the F3 buoy.

Relative motion – 0.75 mile range – 0.25 mile rings
Relative 6 minute vectors





Relative motion – 3 mile range – 0.5 nm rings
True vectors with manual 14.5 kts speed input

2.3 Events after collision

The next recorded radio message was not timed but was a call from Norwegian Dream to Dover Coastguard on VHF Channel 16. Before the message could be completed, a "Securité" message from Ever Decent, timed at 00 hours 56 minutes 40 seconds, was broadcast over the Norwegian Dream's message, informing all stations about the collision and giving a position of 51° 26' North, 001° 56' East.

At the time of the collision, the captain was asleep in his cabin, on the starboard side immediately abaft the wheelhouse, and was woken by the sound and sensation of the collision. The staff captain was first to arrive on the bridge where one of his first actions was to close the water tight doors after which he gave the 'Code Delta' (Ship Damage) announcement, a coded signal for crew, on the public address system. The captain reached the bridge shortly afterwards and took charge of the situation. The emergency signal of seven short blasts followed by one long was sounded through the public address system.

The captain of the Norwegian Dream stated that he spoke with the Ever Decent after the collision to ascertain what damage had been caused, and later before the Norwegian Dream left the scene. Neither of these conversations was recorded by CNIS. The Norwegian Dream learnt that there were no injuries aboard the Ever Decent, but that there was a fire. The Norwegian Dream stated that she was not in a position to help in dealing with the fire but that there were many other ships in the vicinity.

The Norwegian Dream established communications with both the Maritime Rescue and Co-ordination Centre, Dover (MRCC) and the CNIS, as well as with the ship's agents and Owners.

The passengers were mustered at the designated muster stations immediately after the emergency signal was sounded on the public address system. The reports from these stations and from those in charge of each of the fire safety zones were collated. All passengers and crew were accounted for. Both the captain and the cruise director made many announcements to the passengers and crew concerning the situation.

The captain, staff captain, radio officer, cruise director and an able seaman/helmsman eventually manned the bridge for the first period after the collision. Other officers, including the training officer, the 800 to 1200 first officer, chief officer and some junior officers attended the bridge to take orders or pass messages. With minor variations this manning was maintained until arrival at Dover. The OOW at the time of the incident was sent to inspect the damage on the forward mooring deck. When he returned to the bridge, he reported feeling unwell and was sent to his cabin. Before arrival in Dover, he was subject to drugs and alcohol tests which proved to be clear.

The cruise director established other communications to the fire and safety zone leaders. Specific instructions were passed to the zone leaders, the chief engineer, the training officer, the first officers and the security officers as well as others. The engine room was specifically instructed to check for damage and any leakage. A detailed bridge emergency logbook was

not kept. The muster list had allocated that duty to the cruise director and in the regular practices and drills both she and the radio officer had performed it. In the emergency procedures that followed the collision both those officers became primarily occupied with their duties of gathering reports from and passing orders to zone leaders and those officers detailed to report about the damage, in the case of the cruise director, and with external communications by radio, telephones, facsimile and email, by the radio officer. Various notes were kept but none that would form a detailed chronological record of the event.

At 0118 the engines were run ahead in engine room manual control and the heading was steadied to 017°. The swing to starboard was restarted at 0123 until the heading was steadied at 030° at 0133. It remained between 030° and 025° until 0146 when a steady course alteration to port was commenced and held until the heading was steadied up on 214° at 0156.

The passengers were stood down from their emergency stations at 0157 and invited to return to their cabins as the vessel had then resumed her course to Dover. At the same time the Norwegian Dream reported to Dover Coastguard that she was underway, bound for Dover at reduced speed. Initially the speed achieved was 7½ knots over the ground. This increased to about 11 knots by 0400. As the ship approached the Dover Pilot station the speed had increased to about 12 knots over the ground, which was equivalent to about 14 knots through the water.

The Dover pilot boarded the Norwegian Dream at 0523 and the ship was moored alongside the Dover passenger terminal at 0635.

For a description of the damage to both vessels see Annex 8.

Chapter 3
ANALYSIS

3.1 Introduction

At first sight the situation seems clear. The Norwegian Dream had the Ever Decent on her starboard side forward of her beam, therefore, the Norwegian Dream was the give-way vessel (COLREGS Rule 15 – Crossing situation) and she should have kept out of the way. However, with the benefit of the reconstruction and other evidence, it is apparent that that the circumstances were much more complex than that. There were many factors constraining and otherwise affecting the actions of the two vessels. As will be apparent from this analysis, the accident was the result of the actions of numerous people and bodies, some acting with the best of intentions. In most accidents, many of these actions would have been hidden by the mists which shroud the memories of all parties when they have been involved in such a traumatic event, in this case it is possible to look more carefully at the full picture.

3.2 The circumstances of the collision

As can be seen from the sequence of plots in the narrative, the situation of both the Norwegian Dream and Ever Decent was complicated by the presence of the other ships in the immediate vicinity. The Norwegian Dream was overtaking a ship on her starboard side, which had two effects: it obliged her to keep out of the way until finally past and clear (COLREGS Rule 13 - Overtaking); it also prevented her from altering course to starboard for much of the time when she was approaching the Ever Decent. She was also being approached on her port side by a ship on a collision course with a predicted time of collision of approximately 0051. It was the Norwegian Dream's duty to maintain her course and speed with respect to this ship (COLREGS Rule 17 - Action by stand-on vessel). The approaching ship did not alter course until it was 2.5 miles away at 0042. The presence of this ship inhibited any alteration of course to port to parallel the Ever Decent's course and any reduction of speed. The presence of this and other ships to port continued to inhibit any action to parallel the Ever Decent's course. Therefore for much of the time during the approach to the collision, there were restraints on the Norwegian Dream's actions. There were also on board factors which affected the OOW's actions, these will be looked at separately.

The Ever Decent was overtaking a ship on her starboard side which limited her options for taking complementary avoiding action to assist the Norwegian Dream. The Ever Decent had a duty, with respect to the overtaken ship, to keep out of her way (COLREGS Rule 13). The overtaken ship altered course at about 0048 to pass under the Ever Decent's stern, although, at this time, the ship's movement would not have been visible from the Norwegian Dream as she was in transit with the Ever Decent. Had the Norwegian Dream made a large alteration to starboard, as requested by the Ever Decent at about this time to go around the Ever Decent's stern, she would have had a very close encounter with the recently overtaken ship. In the circumstances, the Ever Decent should not have asked the Norwegian Dream to go to starboard round its stern or, at least, should have advised the Norwegian Dream of the other ship's action as soon as it became apparent that she had altered course. The Ever

Decent did not take any apparent action before the collision and seems to have relied on a VHF exchange 4 or 5 minutes before the collision as being sufficient. It is known that there was a North Sea pilot aboard the Ever Decent, however, and it is understood that he was on the bridge during the period before the incident. With his additional knowledge of the area this reliance on very late VHF action is hard to understand. The ship was approaching the encounter at 20 knots and, although she was obliged to keep out of the way until she was finally past and clear of the overtaken ship, after that point, some 7 minutes before the collision, it should have been apparent that action by both Ever Decent and Norwegian Dream was required (COLREGS Rule 17). However, action by Ever Decent did not have to be delayed until a collision could not be avoided by the actions of the Norwegian Dream alone (COLREGS Rule 17).

The position was complicated because the ship being overtaken by the Ever Decent was visually obscured from the view of the Norwegian Dream for several minutes from about 0048 to about 0051. Had the OOW of the Norwegian Dream realised that another ship was coming around the Ever Decent's stern he may not have been so ready to agree to the Ever Decent's request to alter around her stern. It seems probable that the OOW on the Norwegian Dream mistook the vectors displayed on his ARPA and confused the relative and true directions of the Ever Decent. This led him to believe that the Ever Decent was about to pass ahead of him about ½ mile away and in turn to decide to make a small alteration to starboard simply to increase the passing distance. This mistake seems to stem from the practice of using true vectors to assess risk of collision. It was not helped by the need to answer a VHF call at such a critical time or by the OOW having been distracted from the plot earlier by the entry of the crew member who wanted to have the garbage record book signed. During this crucial time he was also conscious of the need to make a VHF reporting-in call to the CNIS before the ship passed the F3 buoy. This was a company requirement, the mandatory requirement was to report before reaching a point 2 miles from the Mid Falls buoy. The pressure on the OOW at this time seems to have caused him to become a little confused, however, even with the benefit of hindsight and a simulated re-construction of the event which can be viewed at leisure and without the pressures to which the OOW was subject, it is hard to see a simple solution to the situation which faced him.

3.3 Actions on the Norwegian Dream

3.3.1 General

There was an assumption by everyone involved in the management of the bridge of a high level of officer competence. This extended to allowing the bridge watchkeepers to adjust course and speed throughout the voyage with minimal monitoring by senior personnel. It was also assumed that all the OOW's were capable of dealing with the most complex traffic situations without assistance. The captain's Night Orders, which were common for both the relief captain and the permanent captain, refer only to the need to call him if in doubt about the ship's position or in reduced visibility. The company's Procedures Manual says that the OOW should ask for assistance when heavy traffic makes it necessary, but this was not the common practice.

There was only one azimuth mirror on board, it was available inside the wheelhouse but was not used during this watch. It appears to have been normal practice for the watchkeeper to not keep any visual check on the compass bearings of other vessels or on the ship's position. This was contrary to the company's Procedures Manual. For navigational purposes, electronic aids were relied on.

3.3.2 Officer Of The Watch (OOW) at the time of the collision

The OOW was a Norwegian national who was well qualified for his post, including full radar training, and who had spent some two years on the Norwegian Dream before the incident, including approximately ten passages between Oslo and Dover, similar to the one being carried out at the time of the incident. Before joining the Norwegian Dream he had spent some time in the North Sea on other ships.

He was accustomed to the practice of being the sole watchkeeping officer accompanied by a lookout. There was a second rating available for bridge duties but he was normally engaged on duties elsewhere on the ship, although he could be contacted by radio. The OOW would not therefore have come naturally to a decision to call for assistance during the approach to the F3 crossing gate. It seems that during the period immediately before the collision he became confused about the exact situation around him. There were mitigating circumstances, as will be described later, but his bridge practice did fall short of the ideal in several areas.

He relied heavily on the use of radar for his anti-collision work, and did few visual checks. Unfortunately, he did not use the radar in the most effective way. He used the ARPA output from both of the radars in use, this meant that he did not have a single, continuous, reliable plot when matters became critical. He used a manual speed input based on estimated speed over the ground, the latter, although it was not a significant factor in causing the collision, was wrong in principle.

About quarter of an hour before the collision, the OOW's attention was diverted by the need to deal with a crew member who wanted the garbage book signed. This took only about three minutes, but it was at a time when the ship approaching on a collision course on the port bow (C) altered course at a distance of about 2.5 miles and about 9 minutes before the predicted collision point with that ship. This was an important time as he was obliged to maintain his course and speed for this ship and this limited his actions in relation to the Ever Decent which was only about 3.5 miles away, also on a collision course. Additionally, it was a time when the general traffic situation was becoming very busy. The ship being overtaken by the Norwegian Dream was still forward of the beam 2.2 miles away reducing the options for altering course to starboard. The alternative of reducing speed was not a straightforward choice; it would have put the Norwegian Dream back into the path of the ship which had recently altered course and possibly other ships on the port side. The OOW was approaching a very close quarters situation with the Ever Decent with severe limitations on the actions available to him.

About 4 to 5 minutes before the collision, the Ever Decent called the Norwegian Dream on VHF and asked her to alter to starboard to pass around her stern. This was an unfortunate call for several reasons. Firstly, it distracted the OOW's attention from his radar plot. This was significant because the ship being overtaken by the Ever Decent altered course to port at about this time to pass around the Ever Decent's stern. This was probably not visible from the bridge of the Norwegian Dream and probably not on her radar, but, had the OOW not been distracted by the call, he may have been able to detect this alteration earlier. As it was, when he looked at the radar he appears to have confused the Ever Decent's true vector with her relative vector. This led him to believe that the Ever Decent would pass ahead of the Norwegian Dream and in turn to believe that a small alteration of course to starboard would help to increase the passing distance. The VHF call was also unfortunate because it seems to have been the Ever Decent's sole action to avoid a collision and had the Norwegian Dream altered as expected by the Ever Decent it would have resulted in a close quarters situation with the ship passing around the Ever Decent's stern.

The OOW very rapidly realised that his alteration was ineffective and before the ship settled on her new course he put the helm hard to starboard and the combinators (i.e. bridge controls of main propellers) to full astern.

After the collision the OOW played little part except for examining the forward mooring deck damage. He was tested for both drugs and alcohol but was found to be clear. He had been on watch for less than an hour when the accident happened and there is no evidence of fatigue.

3.3.3 The Captain

The captain was the relief captain who worked 7 weeks as captain and 7 weeks as staff captain. He was a Norwegian national and had held a Master's Certificate since 1991. He had been with Norwegian Cruise Lines and earlier Royal Viking Line, which was acquired by Norwegian Cruise Lines, for about 24 years the last two of which were as relief captain/staff captain.

He followed the common practice of the ship in leaving the routine navigation to the OOW, including adjusting speed as required to meet scheduled arrival times. After sailing from Oslo, he visited the bridge regularly during the voyage, the last time before the collision being during the 1600 to 2000 watch, but he did not go to bridge for at least five hours before accident. He left no detailed instructions about when he should be called, apart from his standing orders which set out that he should be called before the pilot boarded and, additionally, if the OOW was unsure of the ship's position or the visibility was below 2 miles.

At the time of the collision, he was asleep in his cabin which was close to the bridge. He was roused by the collision and went straight to the bridge where he took control. His handling of the ship and the situation on board was effective and prevented any escalation of the incident. By keeping the passengers frequently informed about what was happening, he avoided any unnecessary concern.

After arriving on the bridge one of his first actions was to sound the emergency signal and have the passengers assembled at their muster stations. He also called the Ever Decent to check on her condition. All proper checks were carried out to ensure that passengers and crew were safe and to verify that the ship was watertight and safe to proceed.

3.3.4 Staff Captain

The staff captain was a Norwegian national. He began his career in the Royal Norwegian Navy as a radio operator. He later trained in a navigational school, graduating in 1990. After 6 months as a trainee, he joined Norwegian Cruise Lines. After various promotions he was made staff captain in 1998.

The staff captain did not normally keep a watch. His main duties were to be in charge of management, the deck department, radio matters and security. He was also to be available for bridge duties if the captain was not.

On the evening of the 23 August, he visited the bridge at 2000. This was a routine navigational visit. He left instructions about when he was to be called prior to the pilot boarding at Dover. He did not visit the bridge again until after the collision.

He was the first to arrive on the bridge after the collision, having been aroused by the propellers going astern immediately before that event. His first action was to close the watertight doors, he then put out a 'Code Delta' signal on the loudspeaker system. This was to inform the crew that there had been ship damage.

When the captain came to the bridge, the staff captain worked as part of the bridge team to ensure the safety of the ship and passengers.

3.3.5 Lookout

The lookout reported ships throughout the period to the collision. He also told the OOW when other ships were coming close, including the approach of the Ever Decent. How the lookout's reports were acted upon by the OOW is not clear but the OOW did acknowledge receiving the reports.

There was a second rating on watch whose duties were away from the bridge. At the time of the incident, this rating was emptying the aft swimming pool. The two ratings shared the lookout duty working two hours of lookout and two hours of other duties.

3.4 Actions of the Ever Decent

Although the Ever Decent was the stand-on vessel in this case (COLREGS Rule 15 – Crossing situation), the ship's actions were questionable in a number of areas, but, as with the Norwegian Dream, there were mitigating circumstances.

The Ever Decent approached and was crossing the TSS at an angle of about 67 degrees to the line of the South West lane, instead of 'on a heading as nearly as practicable at right angles to the general direction of the traffic flow' (COLREGS Rule 10 (c) – Traffic separation schemes). She also approached a small congested area, where many ships were converging, at about 20 knots, without apparent due regard for the potential dangers involved. (COLREGS Rule 6 (a) (ii) and, probably, 6 (b) (v) – Safe Speed and Rule 2 – Responsibility.)

When those on the bridge of the Ever Decent realised that a problem existed with the Norwegian Dream, their sole response seems to have been to make a VHF call to ask the Norwegian Dream to alter course to go around her stern. They then failed to take any significant action when collision could not be avoided by the action of the give-way vessel alone. (COLREGS Rule 17 – Action by the stand-on vessel and Rule 8 – Action to avoid collision.) No actions to alter course or speed are discernable on the shore radar plot of the incident.

At about the time the VHF call was made to the Norwegian Dream asking her to go around the Ever Decent's stern, the ship (B) being overtaken by the Ever Decent was altering course to port to go around the Ever Decent's stern from the opposite direction. The potential conflict which this would cause was never passed to the Norwegian Dream and yet it can be seen from the reconstruction plots that there would have been a serious danger of collision between the two ships had the Norwegian Dream made a large alteration of course to go around the Ever Decent's stern. It is also clear from the reconstruction that at least the initial part of the manoeuvre would probably not have been visible from the Norwegian Dream because of the two ships being in transit. Additionally, the altering ship (B) remained with a similar aspect throughout, showing red, making visual detection of the alteration difficult.

Any early action to avoid a close quarters situation by the Ever Decent was inhibited by the proximity of the ship to starboard which she was overtaking at a distance of about 1 mile. To some extent this passing distance may have been influenced by the fact that the crossing gate at the F3 buoy, for ships heading in South Easterly direction, is only 1 mile wide.

3.5 Effects of the Traffic Separation Scheme (TSS) on the behaviour of the various ships in the area

Although a TSS is intended to keep ships on potentially conflicting courses apart, at a crossing 'gate', such as the one near to where this incident took place, it actually focuses ships into a small area and can increase the pressures on an OOW by creating a number of close quarters situations simultaneously or in rapid succession. There is a clear indication on the official routeing chart (Admiralty Chart 5500) that ships should cross the zone at the crossing 'gate'

In this case, ships were approaching the crossing area from at least three directions: the South West bound traffic lane; the route from Zeebrugge and the River Schelde; and traffic from the North especially from the Thames. From each direction the ships had to keep to comparatively narrow lanes. This had the effect of giving overtaking ships less room to manoeuvre and of their having to pass comparatively close to any overtaken vessels. This limited the actions available to the OOW of a ship required to keep out of the way of a ship which it was overtaking.

The ship which the Norwegian Dream overtook shortly before the collision (A) was joining the south west lane of the TSS at a small angle. Although never closer than 2 miles from the Norwegian Dream, this ship nevertheless had several effects on the possible resolution of the situation. At about 0030, when the Ever Decent appeared on the radar, she was obscured from the Norwegian Dream's view by this ship. Later, she inhibited an early large alteration of course to starboard by the Norwegian Dream. The TSS had the effect of bringing this ship and the Norwegian Dream closer together than they would otherwise have been.

The ship (C) on the Norwegian Dream's port bow approaching on a collision course until about 12 minutes before the collision had come from the South East through the F3 crossing gate. It too had been funnelled into the small crossing zone by the constraints of the TSS. It was initially passing clear and only when the Norwegian Dream altered to port to come closer to the middle of the traffic lane did the collision situation exist. Had the Norwegian Dream stayed on the edge of the lane, then the ship being overtaken to starboard would have had some difficulty joining the TSS.

The Ever Decent overtook a ship on her starboard side (B) with a passing distance of less than 1 mile and it is clear that the overtaken ship had maintained her course and speed because of this (COLREGS Rule 17). As soon as the Ever Decent was past and clear, the overtaken ship altered to port to pass around the Ever Decent's stern. The actions of both ships were influenced by the approach to the TSS and the need to cross the separation zone through the narrow section of crossing gate to the south west of the F3 Buoy.

The TSS in this area separates the opposing flows of traffic into and out of the Dover Strait, but the crossing gate at the F3 buoy causes three flows of traffic to converge and the centre lines of the three lanes meet very close to the collision point. The crossing gate for south east bound traffic is only 1 mile wide, the north west bound section of the gate is about 2.4 miles wide.

Chapter 4
CONCLUSIONS

4.1 Actions of the Norwegian Dream

The Norwegian Dream had a duty to keep out of the way in the encounter with the Ever Decent and the actions which she took did not avoid a collision.

The Norwegian Dream was constrained in the actions which she could take for most of the time when she was approaching the collision point.

4.1.1 Officer Of The Watch (OOW)

The OOW was distracted from his monitoring of the traffic situation during the critical approach to the F3 buoy when traffic was particularly heavy. The signing of the garbage book and the answering of the Ever Decent's VHF call occurred at significant times during the build up to the collision. The consequence was that the OOW had a problem handling the information being fed to him both visually and from the ARPA's. He failed to appreciate at an early stage that a risk of collision was developing.

The OOW was not using his radars/ARPA's to the best advantage. He used the ARPA facilities on both sets which were switched on. One set operated on a 10cm wave length, the other on 3cm. In certain weather conditions this would have ensured a greater chance of detecting all targets, but there would have been fewer problems when the traffic situation became complex had he used just one display for anti-collision plotting. In addition, he was using the true vectors of approaching ships to determine the risk of a close quarters situation. While this is correct in principle, in practice, there is a danger that, at a time when an OOW is under pressure, he will misread the display and, as is probable in this case, use the true vector instead of the relative vector to determine the passing distance of another ship. It would have been better to have used the relative vectors to determine risk of a close quarters situation and to use the true vectors mainly to determine aspect. The use of true vectors is especially difficult in a multi-ship situation.

Once the OOW had realised that the small alteration to starboard was inadequate to avoid collision, he took the proper steps to correct the situation. However, by that time it was too late.

4.1.2 Captain

The captain followed the normal practice of the ship in leaving most of the routine navigation to the OOW. He knew that he had competent officers but he failed to realise that the area in which the accident occurred had the potential to produce a very heavy burden on an OOW and the master should have considered the possibility that the watch should be increased. His standing orders and in particular his standing arrangements with the staff

captain should have been such that everyone was aware that in areas of heavy traffic watches should have been doubled, in accordance with the company's instructions.

The captain usually visited the bridge several times a day and he had arranged that when he was busy the staff captain would visit the bridge. Knowing the area which the ship was approaching, he should have either visited the bridge more often or arranged for the staff captain so to do. If they had done so, they may have realised the pressure to which the OOW was likely to be subjected. The captain did not visit the bridge for over 5 hours before the collision and would not normally have been called until shortly before embarking the Dover pilot.

The captain's actions after the collision were exemplary. They helped to allay the fears of passengers while ensuring that the ship was watertight and fit to proceed. He also checked on the safety of those on the Ever Decent.

4.1.3 The staff captain and other officers and crew

The staff captain visited the bridge at 2000 and would not have normally been called to attend again until shortly before the Dover pilot boarded. Like the captain he should have been more aware of the potential pressures which could occur at certain points in the passage and the dangers of leaving one officer to cope with them.

The staff captain and other officers and crew carried out their duties after the accident in a competent and proper manner. Watertight doors were closed, emergency parties mustered and damaged areas checked and reported to the bridge in an efficient manner. At the same time, passengers and remaining crew were assembled in their muster stations wearing lifejackets. It was ascertained that everyone was safe and accounted for and the facts were reported to the bridge.

One area of the emergency plan which did not function as anticipated was the keeping of a proper record of events after the accident. This was assigned to the cruise director who in the event carried out a vital coordination task especially receiving the reports of the various parties around the ship. The recording task had been assigned to too high a level. It would have been better to have had a more junior person such as a junior purser trained to perform this duty.

4.1.4 Management of information on the bridge

A concern, which arises from an analysis of this incident, is that the amount of information with which the OOW has to deal from time to time can become overwhelming. The ship was equipped with the latest technology and the accident cannot be blamed on a lack of equipment. However, the way in which the OOW receives this information can affect his ability to deal with it and it would seem that the mode of output of the numerous sources of information is important as is the arrangement of the information sources on the bridge. During the approach to the vicinity of the F3 buoy, where the accident took place, the OOW had information fed to him from numerous sources: visual information from outside the

ship, including navigational, traffic and weather; two radar/ARPA sets; VHF; charts; lookout; engine room performance indicators; emergency alarms; watertight doors indicators; manoeuvring indicators; compasses; steering; and so on. Some of these sources required active intervention by the OOW, some visual or audio monitoring, others only a passive awareness of their existence. But, in a situation when traffic is particularly demanding, as in this case, merely having to pay attention to one or two of these many sources may be sufficient to cause an information overload for the OOW. In this case, a crew member came onto the bridge shortly before the collision, distracting the OOW's attention at a critical time. Given the very difficult traffic situation which was developing at the time, this was an unfortunate distraction. The VHF call also significantly affected the OOW's concentration on the traffic developments unfolding on the radar and visually.

There are signs that the OOW simply became overloaded with information at the critical time before the collision. This was not due to inadequate or insufficient technology, if anything the reverse was true, the fact that there were two ARPA's in use at the time and a VHF, actually added to the OOW's problems rather than easing them.

Some further work on how information is presented and managed on a modern, complex ship's bridge would seem to be necessary.

4.2 Actions of the Ever Decent

The Ever Decent's actions were not without fault. The ship approached, and was crossing the TSS on a heading some way away from the right angle to the general direction of traffic flow required by the Regulations (COLREGS Rule 10). It was, in fact, about 67°. She relied on a VHF call made shortly before the collision to arrange that the Norwegian Dream would keep out of her way. She did not then take action to keep clear when collision could no longer be avoided by the action of the give-way vessel alone.

The reconstruction of the incident shows no attempt by the Ever Decent to avoid the Norwegian Dream. The ship made a VHF call some 4 to 5 minutes before the anticipated collision to ask the Norwegian Dream to alter course to starboard to pass around her stern. The agreement of the Norwegian Dream to alter course seems to have been accepted as a sufficient action to take. The Ever Decent should have continued to monitor the actions of the Norwegian Dream and when it was clear that collision could not be avoided by the actions of the Norwegian Dream alone, the Ever Decent should also have taken such action as would have best aided averting a collision (COLREGS Rule 17). As the Ever Decent was travelling at some 20 knots she should have realised how quickly the situation would deteriorate and taken action at about the same time that she asked the Norwegian Dream to alter course.

It was unfortunate that the OOW of the Ever Decent asked the Norwegian Dream to alter to starboard to go around his stern. He must have been aware that the ship which he had just overtaken (B) was altering course to port to go around his stern. He should have realised that, if the Norwegian Dream did as requested, she would come into close proximity with

the overtaken ship. He should also have realised that due to their relative positions, the Norwegian Dream may not have been able to see the other ship's alteration.

There were mitigating circumstances for Ever Decent's lack of early action. She was constrained in the avoiding action which she could take for a considerable time before the collision because she was overtaking a vessel on her starboard side for which she was obliged to keep out of the way. However, there is no obvious reason why she should not have taken action later to help to avert collision.

4.3 The Traffic Separation Scheme in the vicinity of the F3 Buoy

A Traffic Separation Scheme is designed to keep ships apart. However, at the crossing point in the vicinity of the F3 buoy, this TSS concentrates ships from various directions into a small area and makes the occurrence of a number of simultaneous close-quarters situations possible and, from time to time, inevitable. In this case such a concentrated number of close-quarters situations did occur and, even with the benefit of hindsight, it is impossible not to feel a degree of sympathy with the plight in which each ship found itself. The arrangement of the scheme at this point requires some serious study to determine if improvements can be made.

4.4. General Discussion

What this collision emphasises is that we must look beyond the obvious when we seek the causes of accidents. The OOW on the Norwegian Dream had been on watch for less than an hour, he had attended all the relevant training courses and was highly qualified. The Norwegian Dream was a top quality cruise ship, operated by a highly respected company.

What can be seen in this incident is that there is a constant need to review both the way a ship operates and the practices of the individuals on board. There is also a need to periodically re-examine the various systems in place to aid a ship's navigation both on board and ashore. Such reviews should not be simply a reaction to an accident, but a proper, periodic assessment of the risks faced because of the systems and practices currently in place and an examination of the ways in which those risks are being managed. Properly used an ISM audit could provide an useful examination of ship operations, but, it would not cover the practices of individuals and would not look at navigational systems.

The major lesson to be learned from this accident is that the obvious cause of an accident may not be the true underlying cause. The circumstances of most accidents do not allow as complete and accurate a reconstruction of events as this one. Nevertheless when the opportunity does present itself, the lessons to be learned should be absorbed by the whole industry. There were practices on the Norwegian Dream, which needed to be changed and improved. The Ever Decent on-board practices were less than satisfactory and these should be brought out by the flag-state report. The arrangement of the TSS in the area of the F3 buoy does not help to reduce close quarters situations, on the contrary it causes an increase. The limitations imposed by the TSS can also be a hindrance in solving those situations.

CHAPTER 5
RECOMMENDATIONS

To All Bahamian Shipowners

1. When using more than one radar/ARPA, an anti-collision plot should be kept on only one.

2. To determine risk of collision using ARPA vectors, only the relative vectors should be used. True vectors should be used to determine aspect.

3. All bridge watchkeepers should be reminded that the speed input for an anti-collision plot on radar/ARPA should always be speed through the water not speed over the ground.

To Norwegian Cruise Lines

4. The OOW of the Norwegian Dream at the time of the collision should undertake further training in radar usage. Norwegian Cruise Lines should ensure that this is carried out as soon as possible, they should also ensure that other bridge watchkeepers within their fleet are fully familiar with the bridge equipment with which they will have to deal.

5. The Master of the Norwegian Dream should draw up more explicit Standing Orders in accordance with the Company Procedure Manual to clarify when the OOW should call for assistance on the bridge. Norwegian Cruise Lines should ensure that satisfactory masters orders are drawn up for all of their ships.

6. Norwegian Cruise Lines should take steps to enforce and monitor the guidelines contained in their Procedures Manual about when watches should be doubled.

To The Bahamas Maritime Authority

7. Research should be carried out to look into the management of information on the bridges of ships and, in particular, the possibility of bridge watchkeeper overload and the circumstances when this may occur. The Bahamas Maritime Authority should address this matter, in co-operation with other interested bodies, including the International Maritime Organisation.

To Coastal States which have a responsibility for the Traffic Separation Scheme in the North Eastern Approaches to the Dover Strait

8. A study should be conducted to examine the layout of the Traffic Separation Scheme in the vicinity of the F3 Buoy to investigate the possibilities of reducing the concentration of traffic in this small area.

Annex 1

NORWEGIAN DREAM

General Description

Type	Passenger Cruise ship
Registered	Nassau, Bahamas
Owner	NCL Holdings of Bermuda
Operator	Norwegian Cruise Lines of Miami, Florida, USA
Decks	13
Water Tight Bulkheads	17, below deck 5 (deck 4 through the mid-section)
Main Fire Zones	6
Date of Build	1992
Builder	Chantiers de L'Atlantique, St. Nazaire, France
Date of lengthening	March to May 1998 (a 40 metre midsection added)
Conversion Yard	Lloyds Werft, Bremerhaven, Germany
Length overall	229.84 metres
Length BP	200.75 metres
Breadth	28.50 metres
Depth	17.83 metres
Gross Tonnage	50,764 tons
Net Tonnage	28,641 tons
Call Sign	C6LG5
Classification Society	Bureau Veritas
Class notation	✠ I 3/3 E, Passenger Ship /F, Deep Sea, CNC, Ice III
Former Name	"Dreamward"
Main Propulsion	MAN B&W - Total power - 18,480 kW (25,124 bhp) *comprising* • Two x 8L 40/54 developing 5,280 kW (7,178 bhp) and • Two x 6L 40/54 developing3,960 kW (5,384 bhp) *Arranged as two pairs in a "father and son" combination. One or both engines on each side can be connected to one of the two variable pitch propellers of diameter 4,900 mm*
Rudders	Two Becker semi balanced, articulated fin
Transverse Tunnel Thrusters	Two forward mounted, each rated at 1,000 kW
Generators	Two Bergen BRG8 diesels each developing 2,950 kW
Shaft Generators	(fitted to two inner 6L 40/54 main engines) each developing 3,500 kW
Total generator capacity	12,900 kW

Certified to carry a maximum of 2,100 passengers and 700 crew.

At the time of the collision NORWEGIAN DREAM complied with the all statutory and International requirements and certification.

ANNEX 1 cont'd

EVER DECENT

General Description

Following data is taken from the LMIS database, Lloyd's Register of ships, 1997-98 and the MCA database

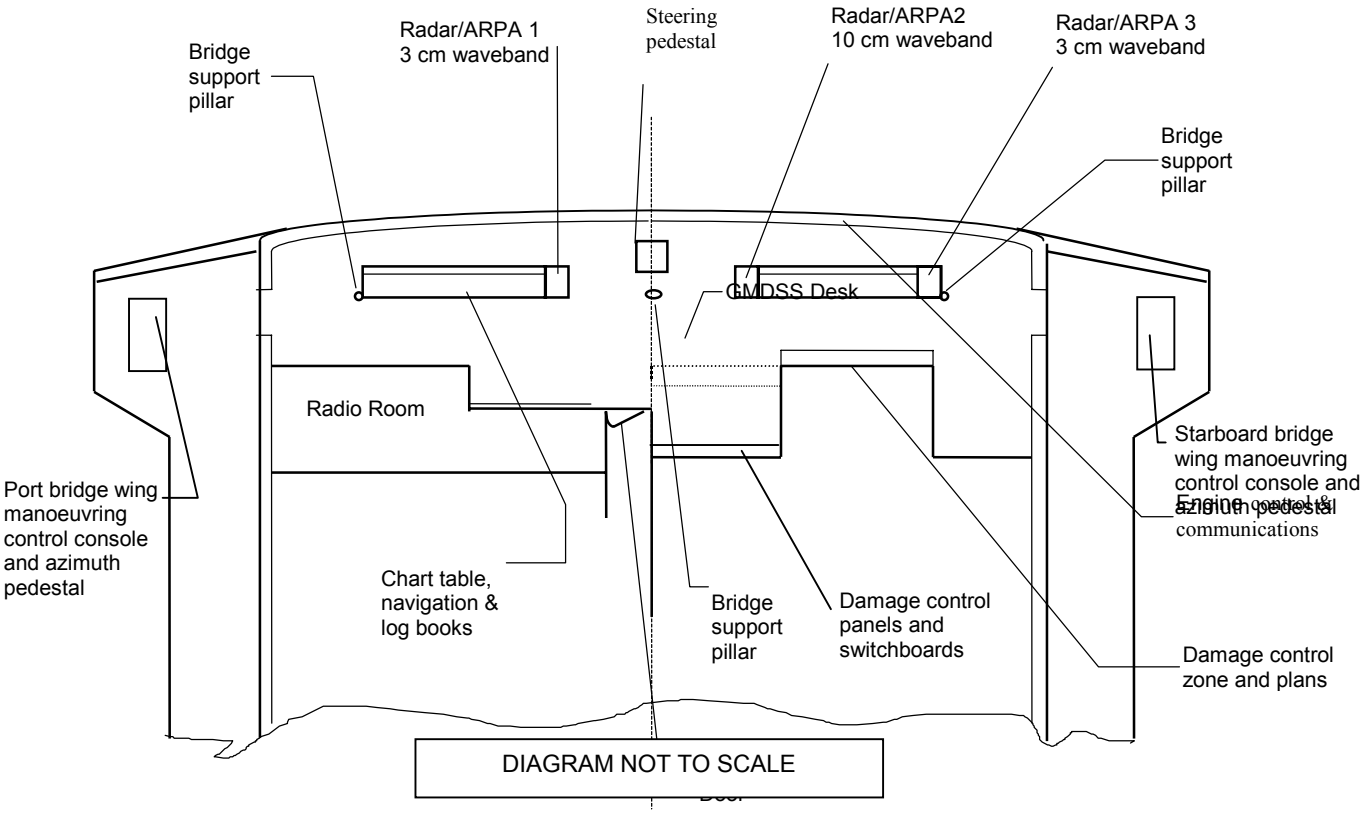
Type	Cellular Container Ship
Registered	Panama
Owner & Operator	Evergreen Marine Corporation, Taipei, Taiwan
Length overall	294.13 metres
Length BP	282.03 metres
Breadth	32.22 metres
Depth	21.25 metres
Gross Tonnage	52,090 tons
Net Tonnage	25,904 tons
Deadweight	55,604 tonnes
Summer Draught	12.60 metres
Container capacity	4211 teu
Call Sign	3FU07
Holds	9 - Cellular, fitted with fixed cell guides
Hatches	16 (13 forward of the bridge, accommodation and machinery spaces with a further 3 hatches aft.
Classification Society	American Bureau of Shipping
Date of Build	1997
Builder	Mitsubishi Heavy Industries Limited, Kobe, Japan
Main Propulsion	Sulzer 12RTA84C developing 43,773 kW (66,120 bhp)
Service Speed	25 knots
IMO number	9134244

Annex 2

NORWEGIAN DREAM

Bridge and Wheelhouse

The general layout of the bridge and wheelhouse is as set out below:



The principal equipment fitted was as follows:

1. 3 Radar/ARPA sets - Sperry Marine Radar RASCAR 3400 M models, port and starboard operated on 3 cm, the centre operated on 10cm.

   All functions of the radars, except the on/off switches, are performed through touch sensitive screens.

2. GPS satellite system - Simrad Shipmate CON30 and Simrad CP4C
3. Echo sounder - Skipper Navigation Echosounder GDS 101 and Skipper Digital Depth Indicator IR-201

4. Log - Sperry Doppler speed log, Display SRD-4215

5. Navtex receiver - JRC - NRC 200A.

6. GMDSS - JRC

7. Gyro - Sperry Marine Gyro Compass Mk 37

8. Autopilot - Sperry Marine Adaptive Gyro Pilot ADG, which is capable of taking input from the gyro compass or from the magnetic compass.

9. Magnetic compass - Marine Data Limited Standard.

10. VHF - JRC Marine radiotelephone JHV-31.

11. Damage Control panel – includes: fire detection system; water tight door control; ventilation; and other functions. There is a damage and control centre behind the Damage Control panel that holds an arrangement of laminated ship's safety plans, mounted on overlapping sliding display boards.

12. Chart table console - includes the control panels and readout displays for most of the navigational equipment.

13. Steering console – includes a compass readout and the various controls for the auto pilot.

14. Engine control and communications console – includes: the main engine and bow thruster controls and indicators; and internal communications, including the bridge public address system.

15. Bridge wing equipment - Each bridge wing is fitted with a remote ship handling and communication console, normally kept under cover when the vessel is at sea. There is a gyro compass repeater on each bridge wing.

Annex 3

Norwegian Dream – manning and qualifications

Rank	**Nationality**	**Qualification**	
		Grade	**Issuing Authority**
Master	Norway	Deck, Class 1, Master Mariner	Norway & Bahamas
Staff Captain	Norway	Deck, Class 1, Master Mariner	Norway & Bahamas
Chief Officer (4-8 OOW)	Norway	Deck, Class 1, Master Mariner	Norway & Bahamas
First Officer (8-12 OOW)	Norway	Deck, Class 2	Norway & Bahamas
First Officer (12-4 OOW)	Norway	Deck, Class 2	Norway & Bahamas

Rank	**No. on board**	**Nationalities**
Training Officer	1	Norway
Chief Engineer	1	Norway
Junior Chief Engineer	1	Norway
Second Engineer (4 - 8)	1	New Zealand
Second Engineer (8 - 12)	1	Norway
Second Engineer (12 - 4)	1	Norway
Third Engineer	1	Philippines
Electrical Engineers	6	4 Norway, 2 Philippines
Refrigeration Engineers	2	1 Norway, 1 Philippines
Deck Crew & Carpenters (including the 2 lookouts)	22	1 Norway, 1 Trinidad & Tobago, 19 Philippines
Operation and maintenance crew: Medical, Security & Radio.	21	1 Norway, 1 Canada, 1 South Africa, 1 USA, 10 Philippines, 3 Poland
Other crew: Passenger services, Catering, Hotel, Entertainment, etc.	575	Various

TOTAL CREW ON BOARD including Master & Officers	**638**	

Annex 4

[excerpt of Admiralty chart 2449 showing the
Collision Point: 319°, 3.2 miles from F3 buoy]

[copies of the chart available from Admiralty chart agents]

Annex 5

[excerpt of Admiralty chart 5500]

[copies of the chart available from Admiralty chart agents]

Annex 6

[excerpts of CNIS Radar plots showing (plot 1) all ships; and
(plot 2) omitting ships ahead on same route as Norwegian Dream]

Annex 7

WARSASH
MARITIME CENTRE

REPORT TO

THE BAHAMAS MARITIME AUTHORITY

FROM

WARSASH MARITIME CENTRE
(SIMULATION SECTION)

"Simulator Reconstruction of Events Immediately before the collision between Norwegian Dream and Ever Decent"

Report written by R E Sawers
Reviewed by J S Habberley

25 November 1999

SOUTHAMPTON
INSTITUTE

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FOR VOCATIONAL TRAINING
RESEARCH AND CONSULTANCY
REG. NO. 926387

INTRODUCTION

This confidential report to Bahamas Maritime Authority (BMA) from Warsash Maritime Centre is intended to re-enact the events leading up to the collision between the Norwegian Dream and Ever Decent which occurred north of the South Falls Buoy during the morning of 24 August 1999.

Our Marchwood based NMS90 full mission ship simulator was used to provide the re-enactment. The use of this simulator allowed the visual scene and radar plots to be viewed from the perspective of both the Norwegian Dream (ND) and Ever Decent (ED). A recording of the visual scene from both ships, through the simulator field of view of 210° has been made and can be viewed on request. This report only provides information from 0012 to 0054, the approximate time of the collision, and does not offer any information after that time.

The re-enactment data were provided from plots supplied by the Channel Navigation Information service (CNIS). Other data were obtained from the CNIS and from the BMA.

The report outline is configured to provide the answers to the 14 questions posed by the BMA during their visit to our Marchwood site on 6 November. The report addresses the issues involved but provides neither conclusions nor recommendations as it is considered they are outside of the scope of the BMA request.

METHODOLOGY

Use of the ship simulator

Ship simulators have been used in the past to provide information following a collision or grounding in order to understand the scenario leading up to the accident. In most cases, the information fed into the simulator is "best guess", but in this particular case the tracks of ships operating in the vicinity to the north of the South Falls buoy were recorded by the CNIS and plot outputs provided to the BMA. These raw data were transposed by WMC and together with course recording information from the Norwegian Dream allowed the bridge view and radar plot information from both the ND and ED to be re-viewed using the ship simulator. Thus a fairly accurate picture was built up and displayed of navigational and traffic events leading up to this particular collision.

Building the simulation

The re-enactment was undertaken on a Norcontrol NMS90 full mission daylight ship simulator. Water depths were input to approximate those shown on Admiralty Chart 1610. Tidal information in the form of tide diamonds taken from that and adjacent larger scale charts was added. Environmental conditions prevailing at the time of the incident were input manually prior to running the simulation. The simulation was carried out in real time at the appropriate time interval from high water.

Information provided by Bahamas Maritime Authority (BMA) in order to input data is listed in **Appendix E**.

Ship tracks were taken from CNIS radar charts provided by BMA and transposed to the simulator using Latitude and Longitude. Start positions, 'end' positions and positions where alterations of course were readily apparent by visual observation were added - times being taken by interpolation between time marks on the supplied charts. No attempt was made to 'mirror' the exact track of any vessel as depicted on the radar plots; tracks were simulated as straight lines between alter-course positions. In respect of ships altering course, simulated 'traffic' ships have set rates of turn and acceleration/deceleration. Without mathematically modelling every ship involved, completely accurate reproduction is not possible. Consequently ship tracks as plotted from the simulated re-enactment do not exactly mirror those on the CNIS radar plots. They are, however, a very good approximation.

In simulating the track of target 950 (mv Ever Decent) a constant course and speed has been assumed up to the time of collision. The target vessel used to simulate the mv Ever Decent visually is a 65,000 ton container vessel. Since no alterations of course or speed are simulated, its handling characteristics are immaterial.

In the absence of an accurate mathematical model of the mv Norwegian Dream the incident was simulated using the cruise liner mv Fantasy which has been mathematically modelled for this simulator. The handling characteristics of the two ships will not be the same and it is not possible to make the mv Fantasy react in the same way as the mv Norwegian Dream. In particular, rates of turn for rudder angle applied are pre-set as are the acceleration and deceleration components due to both engine movements and turns. Lateral drift experienced in a turn is also a discrete function of the model.

Consequently, in order to simulate the last few minutes of the incident, speed reductions from the engine log have been estimated (and have little effect). The amount of helm applied prior to the collision is unknown; regardless, the track followed and the final heading on simulated impact is that of the mv Fantasy whose handling characteristics cannot be altered. Put another way, the simulation was constructed to ensure that the mathematical model of the mv Fantasy was involved in a collision.

Regardless, it is believed that the re-enactment is sufficiently accurate for its intended purpose up to the moment when collision became inevitable.

Simulator readouts

Visual The simulation of the events leading up to and the re-enactment of the collision between the mv Norwegian Dream and the mv Ever Decent can be viewed from the bridge of either ship. On several occasions other ships' lights come into transit with one another leading to a potentially confusing visual scene from the bridge of the mv Norwegian Dream

Radar The radar scanner on each ship is situated above the wheelhouse – that is to say forward on the mv Norwegian Dream and aft on the mv Ever Decent. Mathematical calculation by the simulator in respect of CPA and TCPA of other ships will be taken from the radar positions of 'own ship' to the geographical position of the centre of the target ship. ARPA vectors are displayed accordingly from the centre of radar targets. Further, radar

targets are simulated and do not alter shape, size or position with changes in aspect of target ship as might happen in a real environment. This is relevant when examining the photographic output of the radar screens from the ships involved in the collision. Relative vectors of ED from ND appear to pass well astern - *of the radar scanner position.* In the case of the ND (sic mv Fantasy) there is nominally one cable ship's length behind the scanner. In the case of the ED, the converse is true.

Relevant to this simulation, the radar was used to display a relative picture with the ARPA set to display true vectors. This was in accord with verbal information from the BMA that the OOW of mv Norwegian Dream was alternating between this and a relative vector display. Speed input is normally taken from a water speed log – thus true vectors are water-track. In the case of the mv Norwegian Dream we were advised that the OOW had input a manual speed of 14.5 knots. Accordingly we input the same speed - with the result that *all true vectors as depicted from the bridge of the mv Norwegian Dream are in error.* Whilst we understand that the anti-collision radar on mv Norwegian Dream was used on the 6 mile range, we have changed to smaller ranges closer to the incident. We have also offset the centre.

Bird's eye view This is a display similar to a VTS station depicting the information which has been entered into the simulator on a monitor screen. The operator has the choice of display; however by default each target ship will have a number and a default vector. Vectors are painted from the centre of each ship. Of interest to this simulation, the Bird's eye view (BEV) was used to display a navigation map of the area on which all targets were depicted. In particular it was used to depict the relative vectors of target ships as they would have appeared to the watch-keeper on either ND or ED when using radar in relative motion and ARPA relative vectors.

Presentation of information

Two digital cameras were used to present concurrent information of true and relative vectors obtained from the same relative motion display. (In simulator terms, both the radar and the BEV pictures are generated concurrently by the same piece of software). These images were than edited for consistency using computer software. 'Editing' in this instance includes rotating the image to correct for bad camera angle and trimming to produce pictures covering the same area. Otherwise no enhancements or alterations were made to the 'raw' photographs.

The BEV target numbers are compared to the CNIS target numbers in **Appendix A**.

Radar plots requested by the client are shown pictorially as appendices to this report.

As the simulation was run, an XY plot of target ships was taken. Additionally, XY plots were taken independently with mv Norwegian Dream as 'own ship' and mv Ever Decent 'as own ship'. For clarity, no other traffic is plotted on either of the last two plots.

Other information requested relating to time and distance for specific events has been obtained directly from the CNIS radar charts – these being closest to 'original data' and thus not corrupted by subsequent entry into or extrapolation from the simulator.

Detailed information requested by Bahamas Maritime Authority

All times given below are approximate.

1. XY plot covering the whole CNIS plot period. This is attached as **Appendix B** together with plots of the track of ND (**Appendix B i**) and ED (**Appendix B ii**).

2 & 3 Plots of relative and true vectors of other traffic from the bridge of mv Norwegian Dream are attached as **Appendix C i-v**.

Plots of relative and true vectors of other traffic from the bridge of mv Ever Decent are attached as **Appendix D i-v**.

4. Plot from ND when CNIS target 106 alters course is shown in **Appendix C ii** at times 24 00 42 hrs and 24 00 43 hrs.

5 & 6 These items refer to visual transits occurring from the bridge of the mv Norwegian Dream with traffic on her own starboard side. The times have been obtained by visual observation. Target numbers refer to CNIS target numbers whence visual transits occur from ND between target 049 (being overtaken to starboard of ND) and

target 712 (if within range of visibility)	at 0027 hrs
target 950 from 0033 hrs to 0036 hrs	**Appendix C ii 24 00 36**
target 022 from 0046 hrs to 0048 hrs	**Appendix C v 24 00 36 'Additional visual transits'**

Visual transits occur from mv Norwegian Dream as target 712 is overtaken by target 950 between 0049 hrs and 005130 hrs **Appendix C iii 24 00 49 & 51**

7. The plot from ND showing relative positions and vectors (relative and true?) when request was received from ED to alter to starboard.

During the early part of the visual transit between ND and targets 712 & 950 the CNIS record of VHF traffic indicates that a call was in progress at 00 49 42 BST between the two ships. In that VHF call the request by mv Ever Decent to mv Norwegian Dream to alter course to starboard was made – to which the mv Norwegian Dream responded that she would do so. The radar plot would be as shown in Appendix **C iii 24 00 49**.

8 & 9 Predicted time of collision between ND and ship to port (target 106) up to alteration of course together with time of alteration of course.

Whilst the prudent mariner might have anticipated and been concerned about a developing close quarter situation by observation of either visual or radar bearings, the CPA of target 106 was approx 2 cables from the radar position of ND before target 106 altered course to starboard at 2.25 miles - some six minutes before the CPA would have been attained.

The type of vessel (target 106) is unknown. Visual inspection of the CNIS plot indicates that target 106 was on her 'original' course at 0042 hrs and was settled on a

new course by 0044 hrs. If target 106 was a reasonable size ship, the estimate is that she altered course just after 0042 hrs (simulated at 004215). If she was a small, very manoeuvrable vessel the alteration may well have been up to two minutes later.

10. Time ship overtaken by ED altered course to pass round ED's stern.

From visual inspection of the CNIS data this alteration to port appears to have taken place at 0042 hrs approx. The alteration is shown in both **Appendices C ii and D ii** from **24 00 42 to 24 00 48** and was undertaken at a rate of turn in the region of three degrees per minute. Whilst noticeable on radar from the changing vectors it is not readily discernible by eye. At 24 00 51 hrs the turn was continued and at 24 00 54 hrs the rate of turn increased considerably. Since until this time target 712 remained on the starboard quarter of ED, the increased rate of turn may well have been due to action to avert collision

11&13 Time overtaken vessel was in ED's shadow and clearing distance astern of ED.

Mv Ever Decent and target 712 were in visual transit for some 2.5 minutes between 0049 hrs and 005130 hrs.

No attempt has been made to simulate the situation after the collision. Thus headings and tracks of the involved ships are not accurately portrayed. Thus, assuming mv Ever Decent's heading did not alter after the collision (in itself a known incorrect assumption), then target 712 did not pass the stern of mv Ever Decent until after the collision. At that time she passed some 6 to 7 cables astern of the radar position. This can be seen in **Appendix D v 24 00 53 45**.

Whilst target 712 sharper alteration of course immediately prior to the collision has not been detected by the ARPA on the simulator at the time of the collision a better indication of her track may be estimated from her relative vector shown in **Appendix C v 24 00 53 45** whence she appears to be passing within 3 cables of the impact point – 2 cables from the stern of the involved vessels.

12&14 refer to target transfer.

Whilst during the simulated run the simulator radar has on occasion ceased tracking targets, at no time in the real situation does it appear that targets were so close that vector swap might have occurred.

Appendix A

Ship's name if known	CNIS target no	BEV equivalent no
Norwegian Dream	210	01 or 65 *
Ever Decent	950	01 or 65 *
Rosa M	712	10
	106	11
	049	12
	941	13
	526	14
	093	15
	590	16
	506	17
	022	18

When radar information is depicted as from mv Norwegian Dream it is represented as BEV ship 01. Under these circumstances mv Ever Decent is BEV target 67.

When radar information is depicted as from mv Ever Decent it is represented as BEV ship 01. Under these circumstances mv Norwegian Dream is BEV target 65.

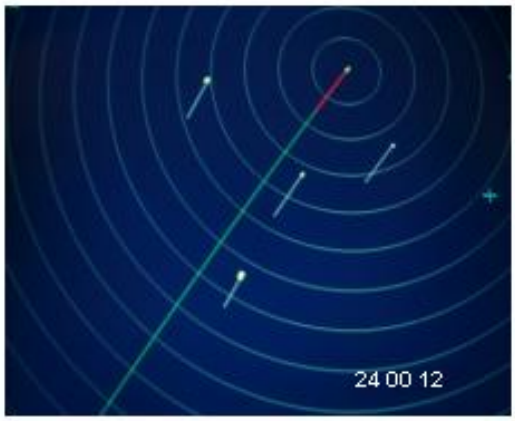
Annex 7
Appendix B

[omitted]

From the bridge of the mv Norwegian Dream

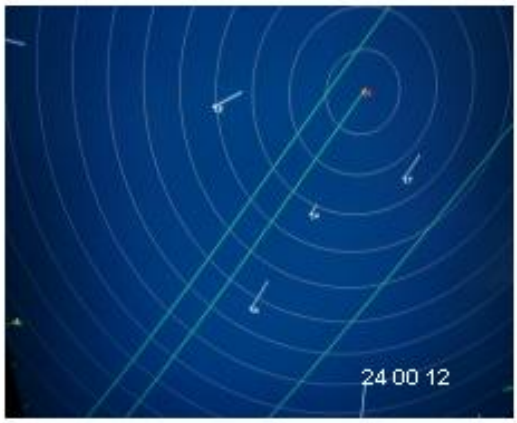
Appendix C i

Synthetic radar picture

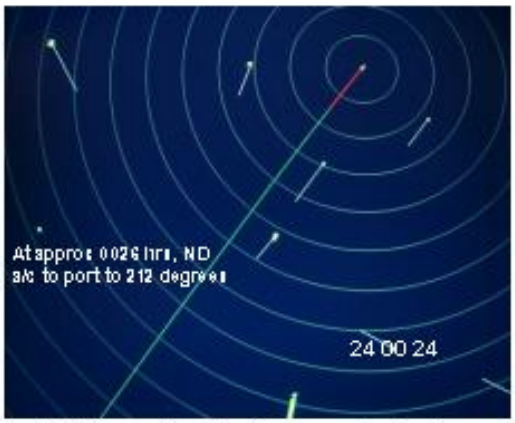


Relative motion - 6 mile range - 1 mile rings
True vectors with manual 14.5 kt speed input

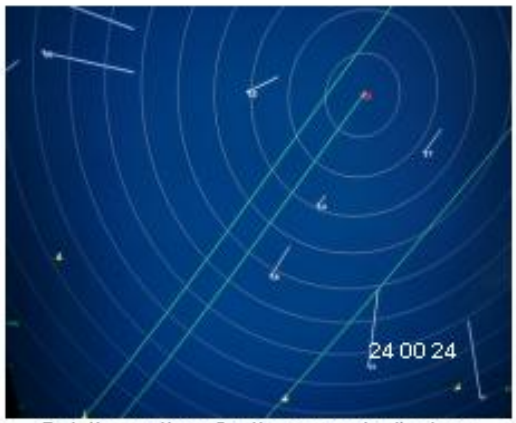
Bird's eye view - BEV



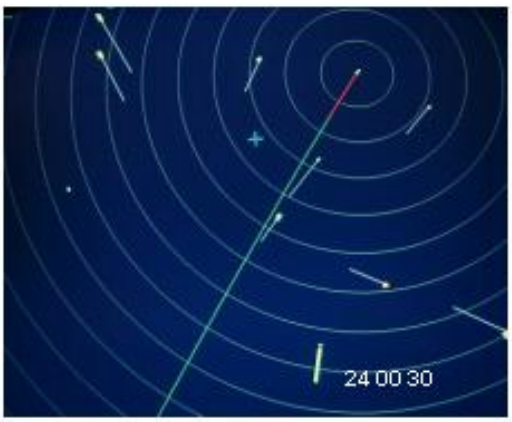
Relative motion - 6 mile range - 1 mile rings
Relative 9 minute vectors



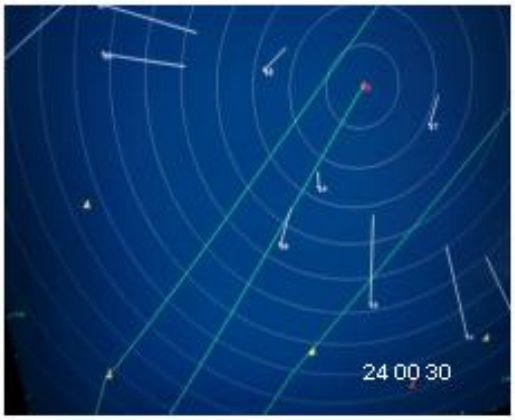
Relative motion - 6 mile range - 1 mile rings
True vectors with manual 14.5 kt speed input



Relative motion - 6 mile range - 1 mile rings
Relative 9 minute vectors

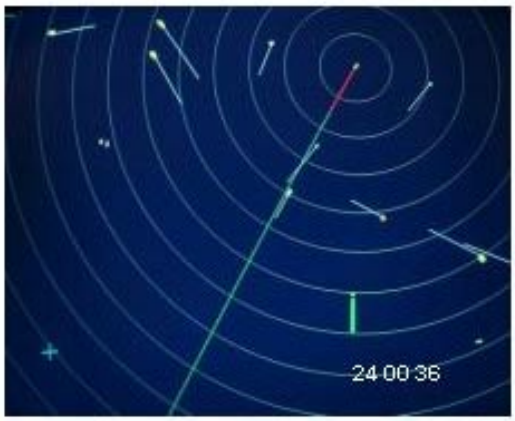


Relative motion - 6 mile range - 1 mile rings
True vectors with manual 14.5 kt speed input

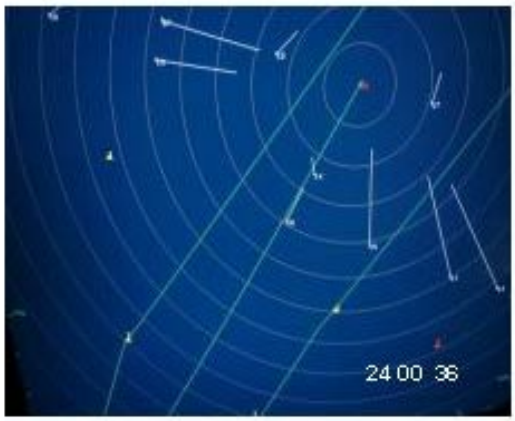


Relative motion - 6 mile range - 1 mile rings
Relative 9 minute vectors

Appendix C ii

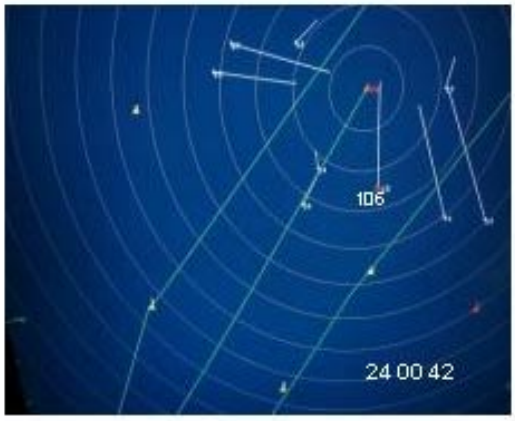


Relative motion - 6 mile range - 1 mile rings
True vectors with manual 14.5 kt speed input

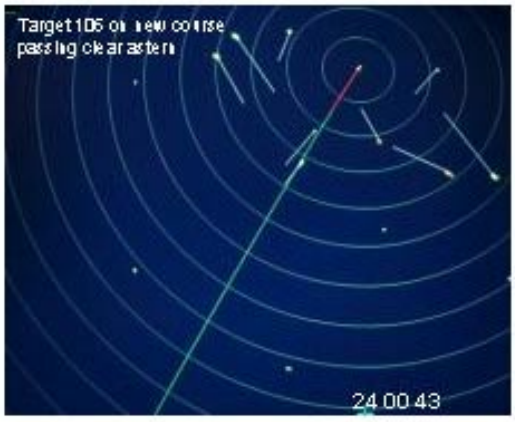


Relative motion - 6 mile range - 1 mile rings
Relative 9 minute vectors

Relative motion - 6 mile range - 1 mile rings
True vectors with manual 14.5 kt speed input



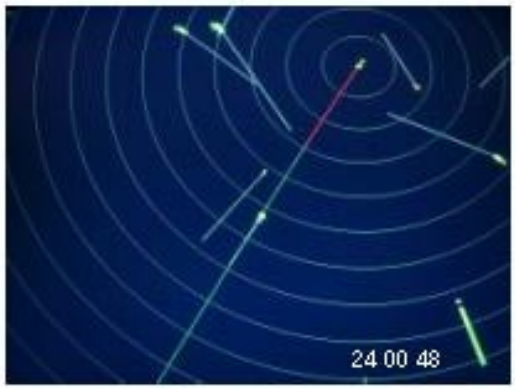
Relative motion - 6 mile range - 1 mile rings
Relative 9 minute vectors



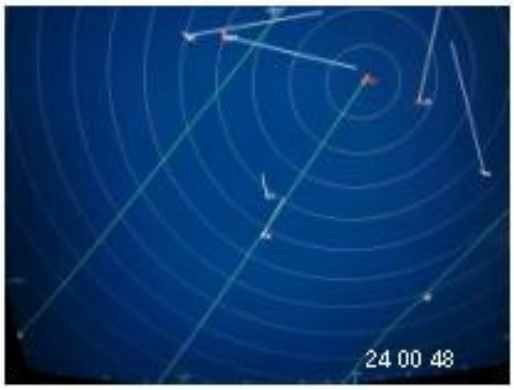
Relative motion - 6 mile range - 1 mile rings
True vectors with manual 14.5 kt speed input

Relative motion - 6 mile range - 1 mile rings
Relative 9 minute vectors

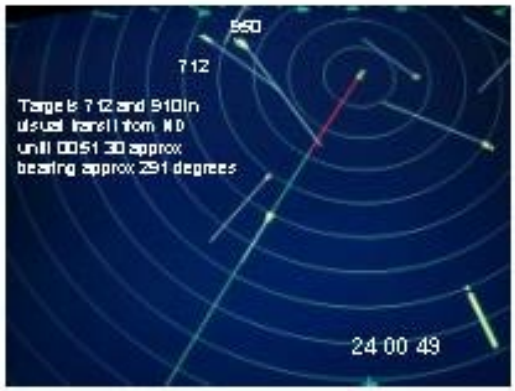
Appendix C iii



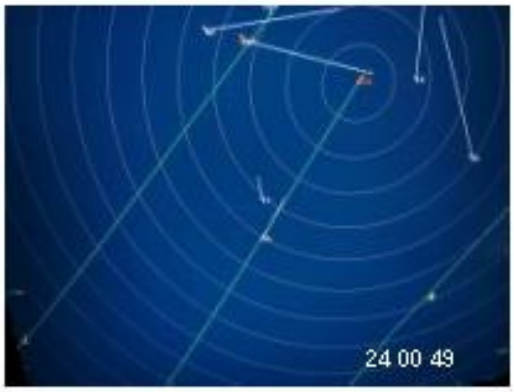
Relative motion - 3 mile range - 0.5 mile rings
True vectors with manual 14.5 kt speed input



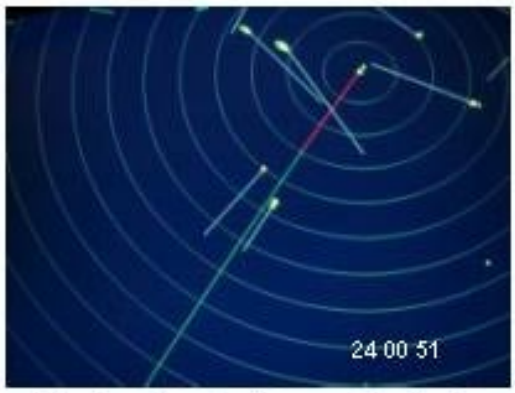
Relative motion - 3 mile range - 0.5 mile rings
Relative 6 minute vectors



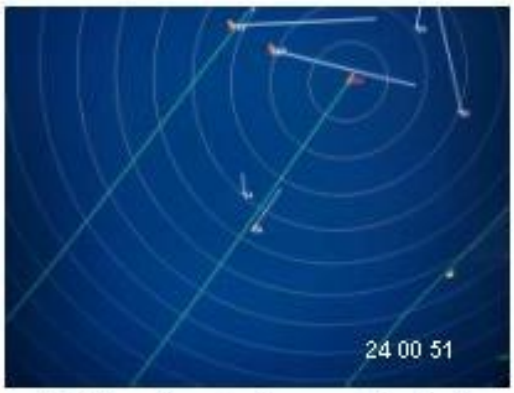
Relative motion - 3 mile range - 0.5 mile rings
True vectors with manual 14.5 kt speed input



Relative motion - 3 mile range - 0.5 mile rings
Relative 6 minute vectors

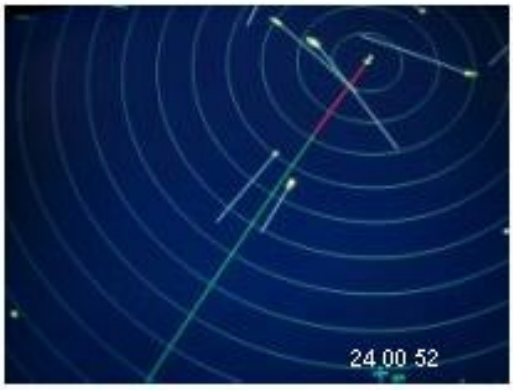


Relative motion - 3 mile range - 0.5 mile rings
True vectors with manual 14.5 kt speed input

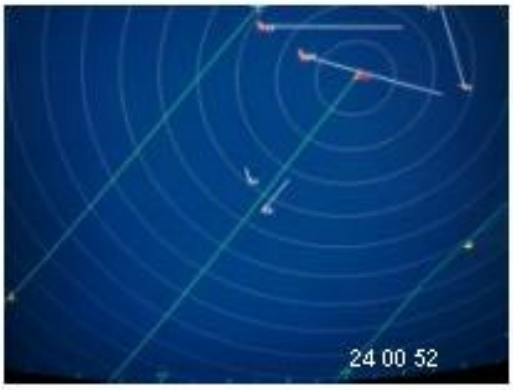


Relative motion - 3 mile range - 0.5 mile rings
Relative 6 minute vectors

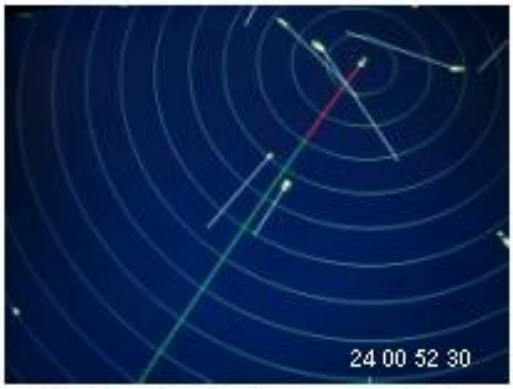
Appendix C iv



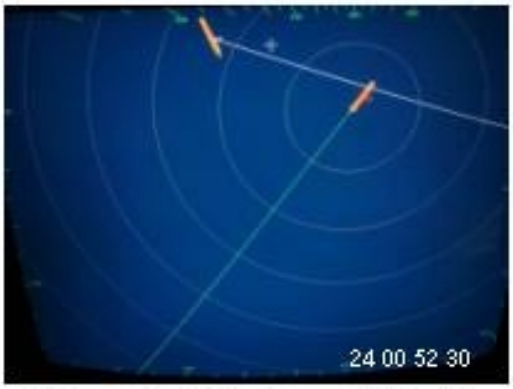
Relative motion - 3 mile range - 0.5 mile rings
True vectors with manual 14.5 kt speed input



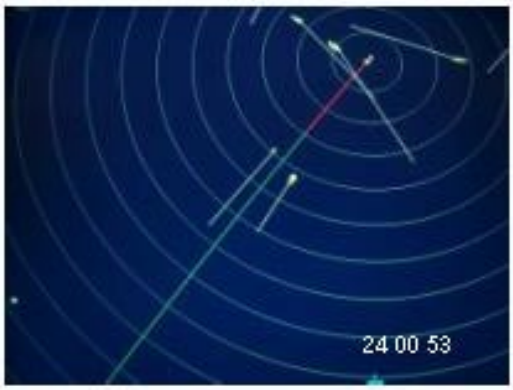
Relative motion - 3 mile range - 0.5 mile rings
Relative 6 minute vectors



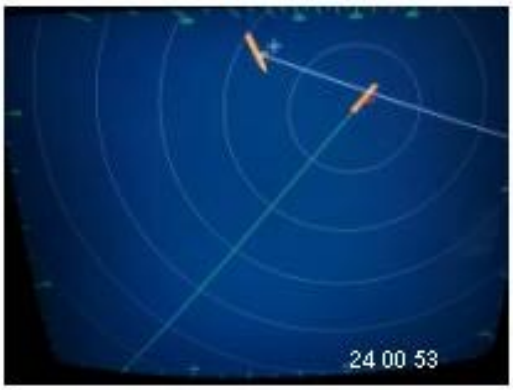
Relative motion - 3 mile range - 0.5 mile rings
True vectors with manual 14.5 kt speed input



Relative motion - 0.75 mile range - 0.25 mile rings
Relative 6 minute vectors

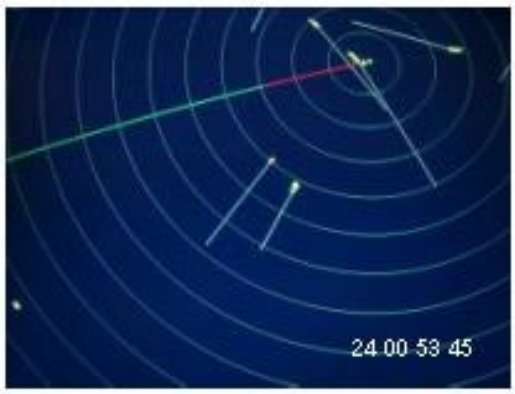


Relative motion - 3 mile range - 0.5 mile rings
True vectors with manual 14.5 kt speed input

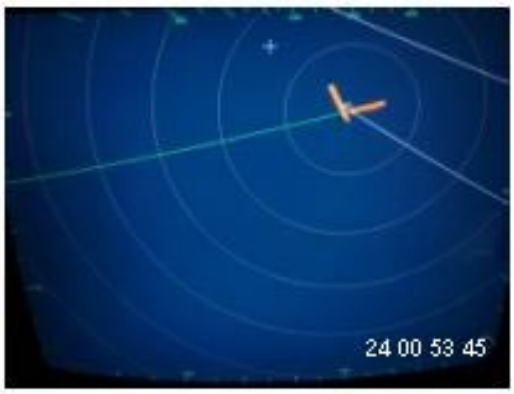


Relative motion - 0.75 mile range - 0.25 mile rings
Relative 6 minute vectors

Appendix C v

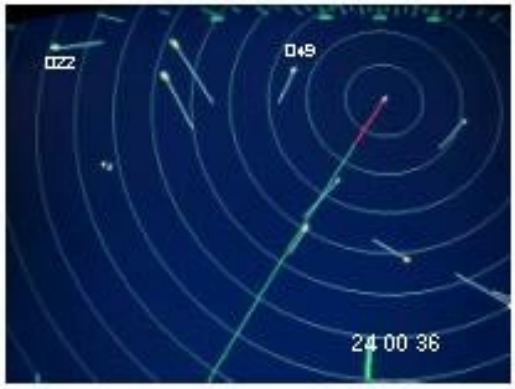


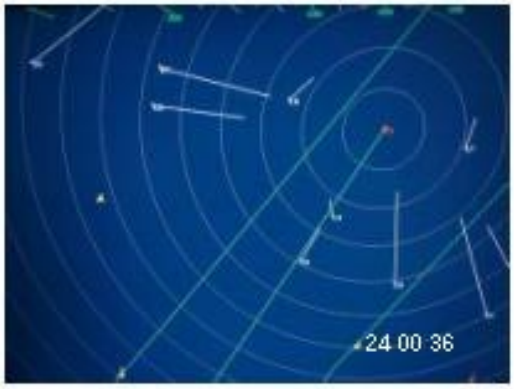
Relative motion - 3 mile range - 0.5 mile rings
True vectors with manual 14.5 kt speed input



Relative motion - 0.75 mile range - 0.25 mile rings
Relative 6 minute vectors

Additional visual transits

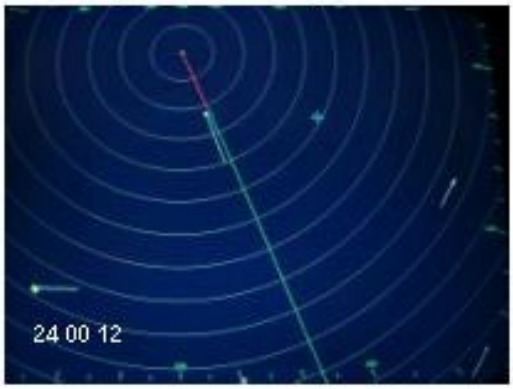




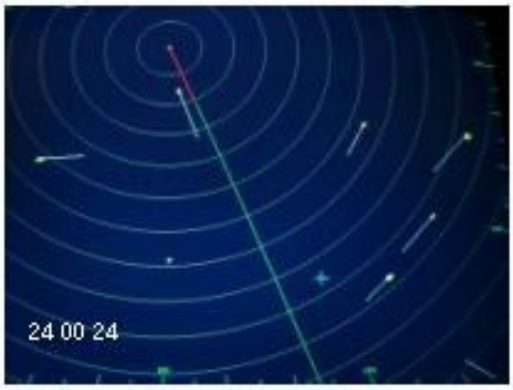
If the target recorded as number 022 by CNIS was visible to the Norwegian Dream, then between 0046 hrs and 0048 hrs approx, it was in visual transit bearing approximately 310 degrees with the overtaken vessel target number 049. (Whilst it has been simulated, the transit has not been recorded on this series of radar and bev images).

From the bridge of the mv Ever Decent **Appendix D i**

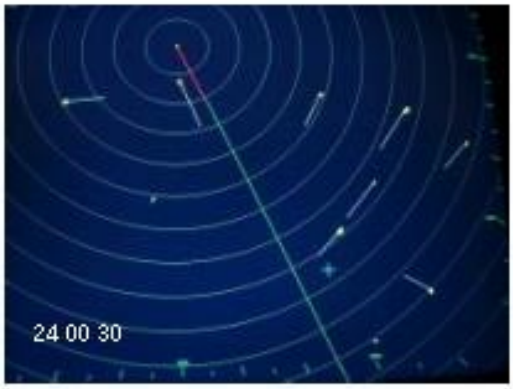
Synthetic radar picture



Relative motion - 6 mile range - 1 mile rings
True vectors - water track

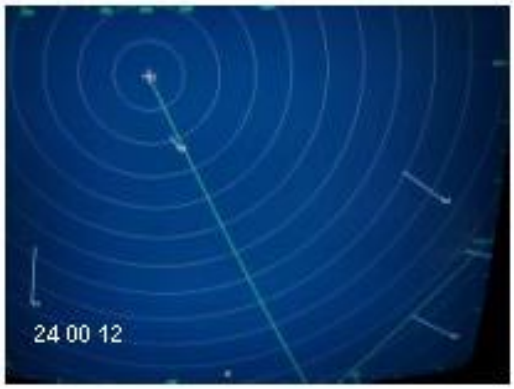


Relative motion - 6 mile range - 1 mile rings
True vectors - water track

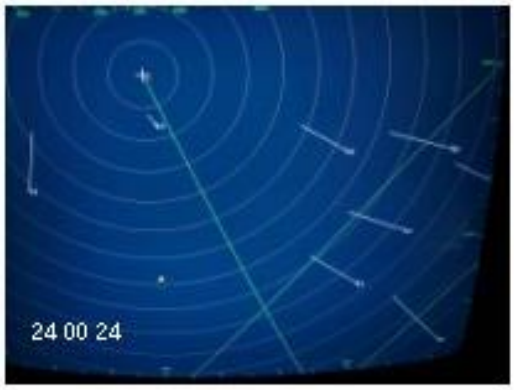


Relative motion - 6 mile range - 1 mile rings
True vectors - water track

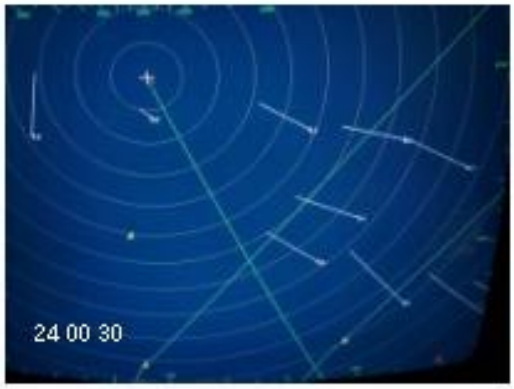
Bird's eye view - BEV



Relative motion - 6 mile range - 1 mile rings
Relative 6 minute vectors

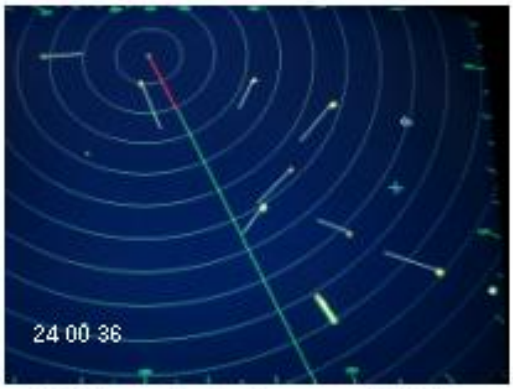


Relative motion - 6 mile range - 1 mile rings
Relative 6 minute vectors

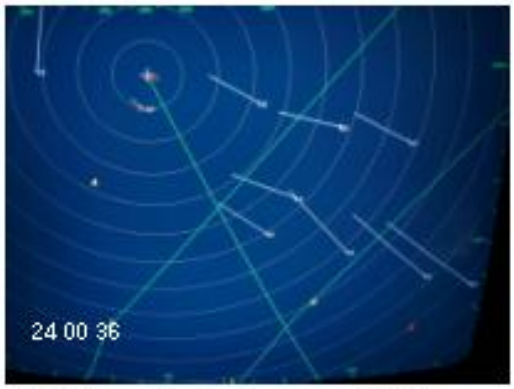


Relative motion - 6 mile range - 1 mile rings
Relative 6 minute vectors

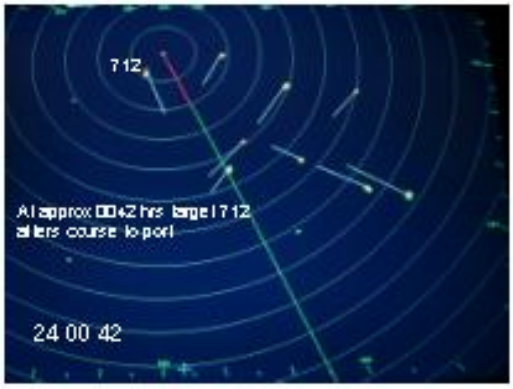
Appendix D ii



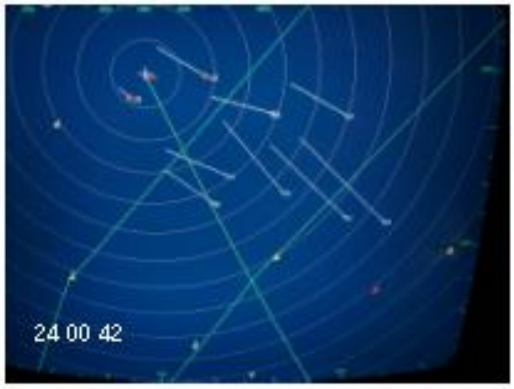
Relative motion - 6 mile range - 1 mile rings
True vectors - water track



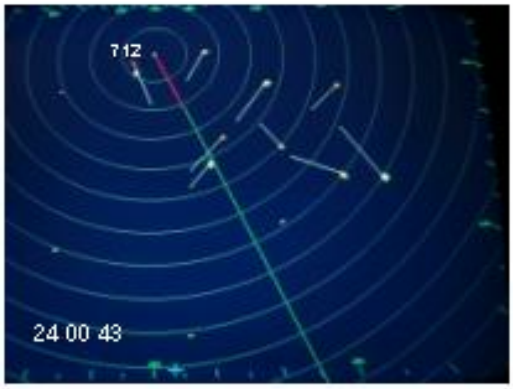
Relative motion - 6 mile range - 1 mile rings
Relative 6 minute vectors



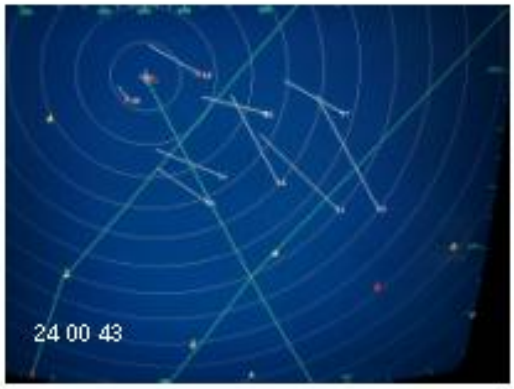
Relative motion - 6 mile range - 1 mile rings
True vectors - water track



Relative motion - 6 mile range - 1 mile rings
Relative 6 minute vectors



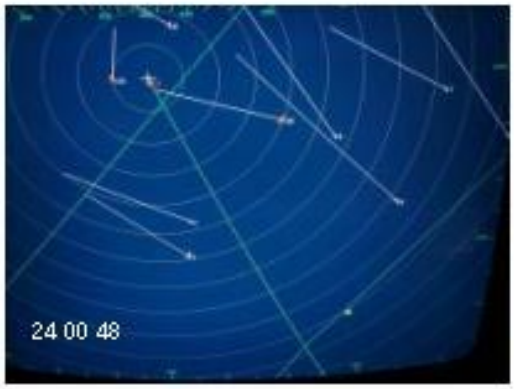
Relative motion - 6 mile range - 1 mile rings
True vectors - water track



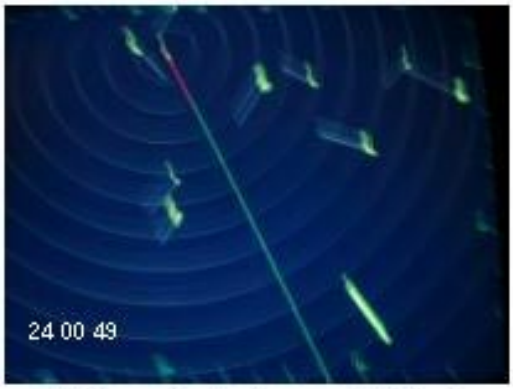
Relative motion - 6 mile range - 1 mile rings
Relative 6 minute vectors

Appendix D iii

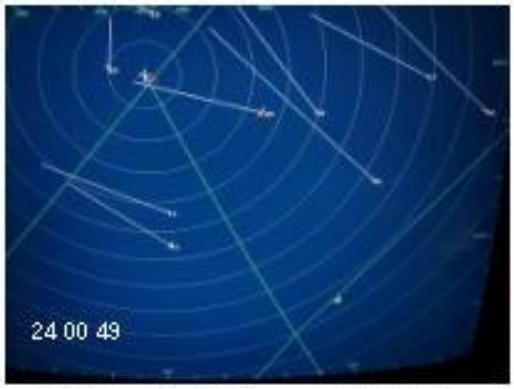
Relative motion - 3 mile range - 0.5 mile rings
True vectors - water track



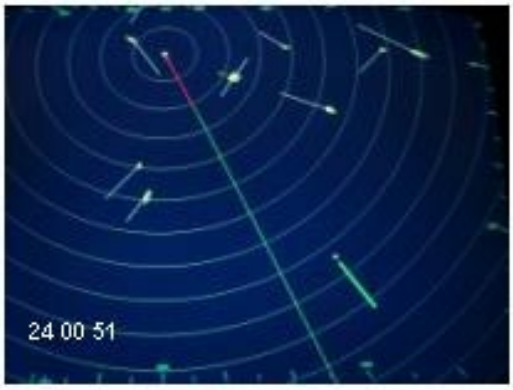
Relative motion -3 mile range - 0.5 mile rings
Relative 6 minute vectors



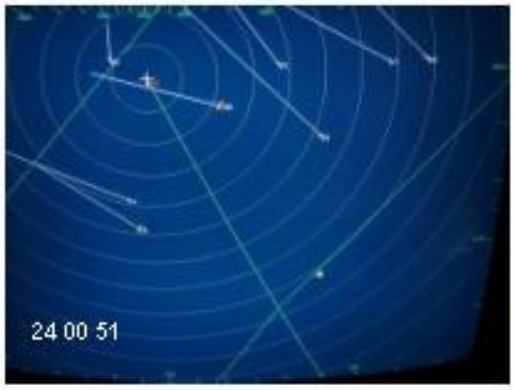
Relative motion -3 mile range - 0.5 mile rings
True vectors - water track



Relative motion - 3 mile range - 0.5 mile rings
Relative 6 minute vectors

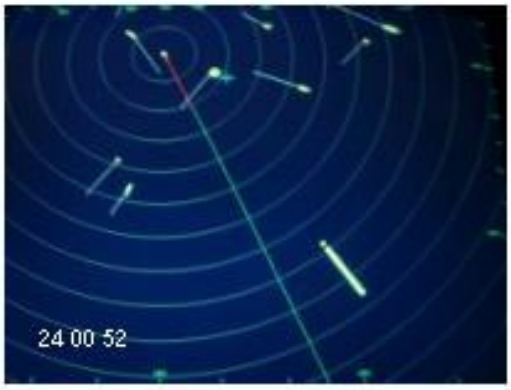


Relative motion - 3 mile range - 0.5 mile rings
True vectors - water track

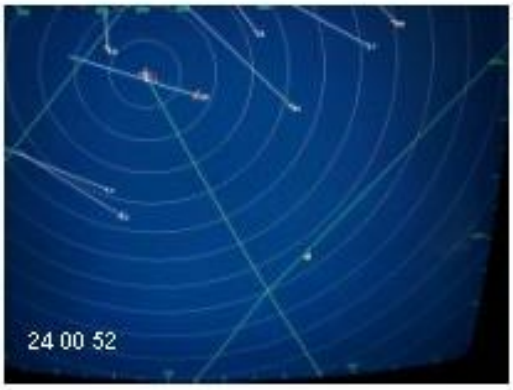


Relative motion - 3 mile range - 0.5 mile rings
Relative 6 minute vectors

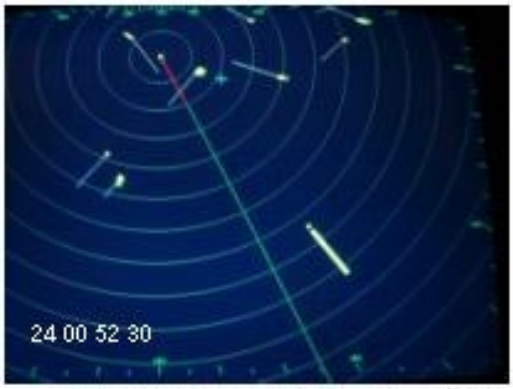
Appendix D iv



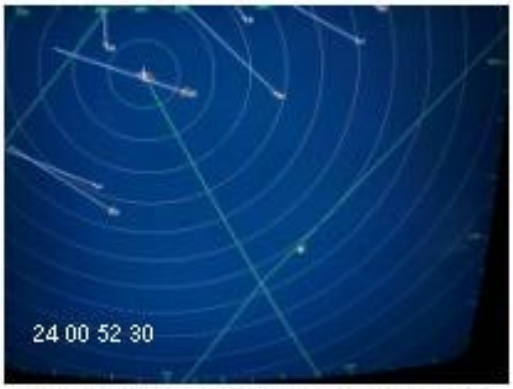
Relative motion - 3 mile range - 0.5 mile rings
True vectors - water track



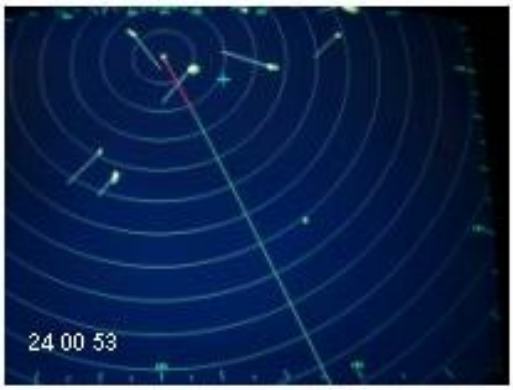
Relative motion -3 mile range - 0.5 mile rings
Relative 6 minute vectors



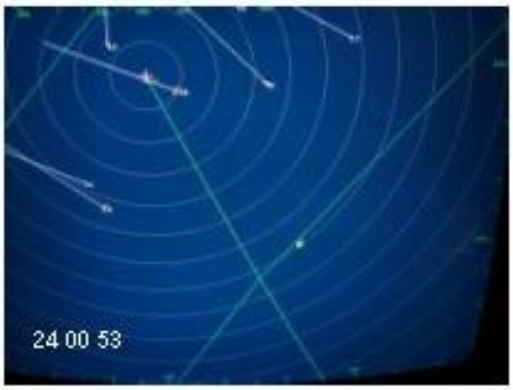
Relative motion - 3 mile range - 0.5 mile rings
True vectors - water track



Relative motion -3 mile range - 0.5 mile rings
Relative 6 minute vectors

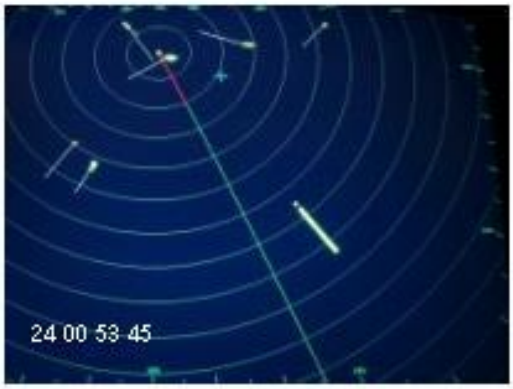


Relative motion -3 mile range - 0.5 mile rings
True vectors - water track

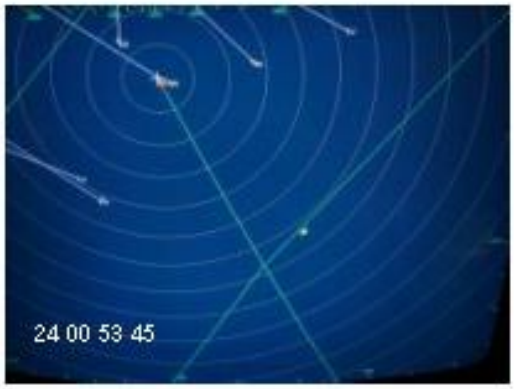


Relative motion -3 mile range - 0.5 mile rings
Relative 6 minute vectors

Appendix D v



Relative motion - 3 mile range - 0.5 mile rings
True vectors - water track



Relative motion - 3 mile range - 0.5mile rings
Relative 6 minute vectors

Appendix E

Documentation made available by Bahamas Maritime Authority

Copies of Dover Coastguard CNIS radar plot sheets

Course recorder data from mv Norwegian Dream from 23 251 gmt until after the incident

Transcript of VHF conversation between mv Norwegian Dream and mv Ever Decent prior to the collision

Engine Data Log printout from mv Norwegian Dream from 23 1936 gmt until after the incident

Annex 8

DAMAGE TO NORWEGIAN DREAM

There were four main areas of damage to NORWEGIAN DREAM:

i The bow and associated structures forward of the collision Bulkhead and the fore peak water ballast tank.

ii The starboard shell plate and associated passenger cabins approximately below No. 11 lifeboat.

iii The starboard rescue boat (lifeboat No. 1,) lifeboat No. 3, the associated structures and some minor indentations in the steel plating in the vicinity thereof.

iv The starboard bridge wing.

THE BOW

The main area of impact was at the forward part of the vessel when the bow struck the side of EVER DECENT. Some containers from the Ever Decent landed on the bow of the Norwegian Dream.

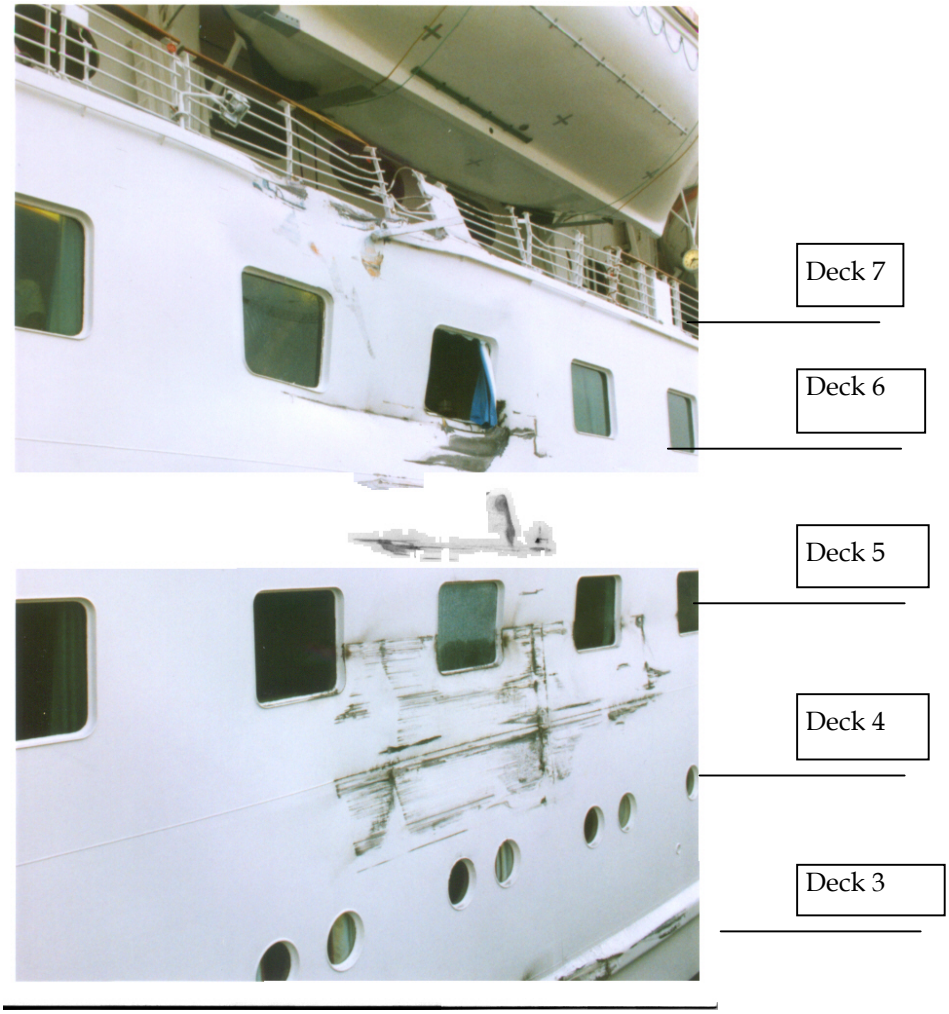
THE UPPER BOW

BULBOUS BOW

Steelwork torn and open to the sea but shape of bulb largely intact despite being slightly twisted and offset to the port side.

THE STARBOARD SIDE

Damage was caused to the starboard side affecting the shell plating, decks and associated passenger cabin fittings

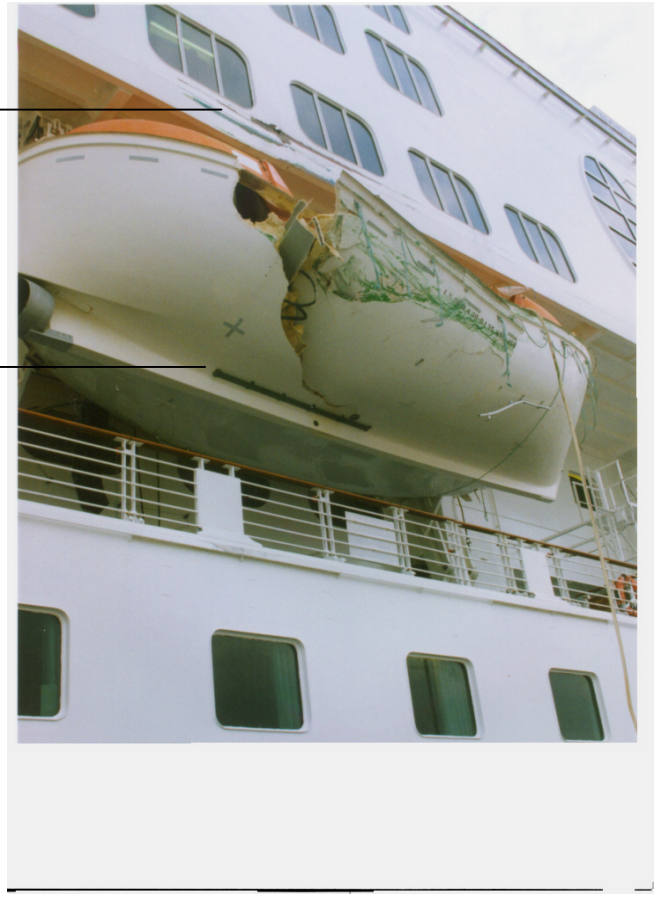


STARBOARD SIDE LIFEBOATS

No 1 lifeboat, a semi-rigid hulled craft (starboard rescue boat), was torn from its davit in the later stages of the collision.

Davit & Lifting cradle of missing No. 1 Lifeboat

The aft part of No 3 lifeboat was damaged.


Damage
No 3 lifeboat


No 3 lifeboat

BRIDGE WING

The starboard bridge wing of the NORWEGIAN DREAM was severely damaged.

EVER DECENT

The exact nature of the damage to the Ever Decent is not known, however, the following photographs illustrate the general damage caused including the extent of the fire in the cargo.

Damage caused by the NORWEGIAN DREAM's bridge wing

It is understood that there was a hole made in the port side shell of EVER DECENT, below the waterline. This initially allowed sea water to flow into the vessel causing a severe port list.

There was minor scraping damage to the port side, aft of EVER DECENT at main deck and sheer strake level.