PART II ANALYSIS OF INCIDENT (INITIAL GROUNDING)

5. INITIAL GROUNDING

Seaworthiness of the Vessel

5.1 SEA EMPRESS operates under a continuous hull and machinery survey regime with Det Norske Veritas (DNV) the classification society. The latest DNV update of vessel information prior to the incident was dated 1 February 1996 and showed no survey items overdue and no conditions of class. The last annual survey inspection was carried out in early February in Tarragona, Spain. No defects were found but three conditions of class were imposed; these related to the calibrating of testing equipment, the production of certain type approval certificates and the provision of sufficient sealing blanks for the inert gas system and crude oil washing tank openings.

5.2 The vessel has a Shipboard Safety and Environmental Protection (SEP) Management System Certificate and a Shipboard International Safety Management (ISM) Certificate issued by DNV.

5.3 For the arrival at Milford Haven the statutory Tanker Check List was completed. The question asking whether the auxiliary steering gear was in good working order had been answered in the negative by marking the NO box. Investigation of this confirmed that the Master marked the NO box to indicate that the vessel was not provided with such equipment; it was not a requirement since two independent primary units were fitted. It is therefore concluded that prior to the accident SEA EMPRESS was in a fully seaworthy condition with no defects which might have contributed in any way to the causes of the initial grounding.

On Board Communications

5.4 After this accident happened, and indeed after the BRAER accident in 1993, concerns were raised about vessels manned by crews, often of more than one nationality, with no common mother tongue. This was not the case with the crew of SEA EMPRESS.

5.5 All the crew on board SEA EMPRESS were Russian. However, the Master's written Standing Orders, the log books, the movement books and all other written entries on the vessel's papers were in English as is the case on the majority of Liberian registered vessels. The Master's spoken English was good, that of the rest of the vessel's bridge team was not but their understanding of nautical terminology in English was quite adequate and gave the Inquiry no reason for concern. The pilot had no difficulties in two way verbal communication with the Master.

The pilot's helm and course orders were all repeated by the helmsman in English, and then in Russian for the benefit of the Master and officers. After each order had been carried out this was reported by the helmsman to the pilot, again in English and then in Russian. The pilot was quite satisfied with the way the helmsman was steering.

5.6 Based on the interviews carried out with the pilot, the vessel's Bridge Team and the Third Officer, who was standing by the anchors when the grounding happened, there were no communication difficulties which might have contributed in any way to the causes of the grounding.

Timing of Entry

5.7 SEA EMPRESS was required to be alongside the Texaco Refinery Jetty not later than the predicted low water time of 2130 hrs. The preferred latest time to embark the pilot was 1930 hrs. This was to allow one and a half hours from the time of the pilot boarding the vessel to being alongside and making fast. The pilot did not board SEA EMPRESS until 1940 hrs and according to Port records the vessel entered the West Channel about 15 minutes later than any previous vessel of that size, although this fact was unknown to the pilot at the time. However, this delay was not a critical factor because the extra time provided by the period of slack water off the Jetty before the tide turned was additional time in hand, and in any case there would have still been enough depth to get alongside, even at low water. Therefore, even though the entry was slightly later than preferred, there was no justification in aborting and waiting until the next tide. Commercial pressure played no part in this either because there were more than adequate crude oil stocks at the Refinery so SEA EMPRESS's cargo was not required urgently.

Courses Steered Prior to the Grounding

5.8 Prior to SEA EMPRESS grounding, gyro courses were being steered as is usual and 'nil' gyro error was recalled by both the Master and the Chief Officer. This is borne out by the previous entries in the log book and the pilot's own impression. Before the pilot boarded and took the con the course on the chart was 012°, this was the course to the requested boarding position. Five charted positions from 1910 hrs to 1940 hrs show that this course was made good. At the time the pilot took the con the course being steered, as recalled by the Master, was 010°. The turn to starboard which the pilot then ordered was by helm orders, initially "hard-a-starboard" as recalled by the Master and helmsman.

5.9 The pilot told the Inquiry he then ordered a course to steer which was "in a northeasterly to easterly direction". The bridge was not fitted with a course recorder and as there are inevitably some differences between the recollections of the pilot, Master, Chief Officer and helmsman as to what this and the subsequent course orders actually were these have been examined by the Inquiry. The initial course was 065° according to the Master and Chief Officer and "about 065° to 070°" according to the helmsman. However, a course of 060° was laid off on the chart from the 1948 hrs position plotted by the Chief Officer so this has been accepted as the first course ordered by the pilot.

5.10 The Master said that the pilot's next course order was 070°, which is similar to the helmsman's recollection referred to above. The Master, Chief Officer and helmsman all recalled the next orders as progressive course changes to port of about 5° at a time, to 025° according to the Master and Chief Officer. However the pilot said that he turned to 035° and, taking into account the positions at 1956 hrs and 2000 hrs and his later evidence, this has been accepted as the most likely course steered towards the Channel entrance.

5.11 This course of 035° was steered until about two to three cables (less than two minutes) before entering the Channel, when the pilot became aware that there was a set to the east. There is no doubt that his order then was to steer a course of 030°, not an order for port helm which would have been the appropriate action in this case. The vessel was still turning to that heading when the bows entered the Channel, very close to the Mid Channel Rocks Light Buoy. It was only at this very late stage that the pilot realised prompt action was needed. He said that he was reluctant to order 'hard-a-port' because in a previous accident when this action had been taken control was lost and the vessel grounded off Saint Ann's Head. It was also possible that the starboard quarter would hit the Buoy if port helm was applied. The pilot walked quickly to the starboard side of the wheelhouse to see how close the Buoy was and the first contact of the fore end with the rocks would have happened only seconds later.

5.12 The Inquiry has checked the details of the accident referred to by the pilot to see if there are parallels between that and the SEA EMPRESS incident. The case the pilot cited was the grounding in 1984 of the loaded crude oil tanker MATCO AVON, although he was not personally involved in the incident. On that occasion visibility had deteriorated as the vessel approached the West Channel entrance. She was found to be passing on the wrong side of the Mid Channel Rocks Light Buoy. Full port helm and full astern pitch was applied. Subsequent full counter helm was ineffective, the swing to port could not be arrested and this led to the grounding. MATCO AVON had a right-handed controllable pitch propeller and the effect of full astern pitch with full port helm caused the loss of control.

Planning and Monitoring of the Approach

5.13 The pilot had intended to and initially did approach the Channel entrance within what he termed "the cone of safety" (see Figure 2). The theory of this is that if an inbound vessel is kept within the cone formed by the lines of the Outer Leads and the Inner Leads extended seawards, then she will leave the point of the cone, the intersection of those lines, very near the middle of the Channel entrance and in the deepest water. Other pilots made similar approaches, so the pilot ordered the course of 035° and at 2000 hrs the vessel was indeed within the 'cone' with a mile to go to the entrance. If the course of 035° had been made good the vessel would probably have safely entered the Channel. The pilot (perhaps correctly) said that the tidal stream off the entrance was slack when he boarded, but according to the sailing directions it was predicted to start running east-southeasterly at 2000 hrs, just 20 minutes later.

5.14 The pilot also told the Inquiry that he was steering 035° to make a judgement as to which way the tide was likely to affect the vessel. This suggests prudence, because it is not unusual for tidal streams to turn earlier or later than predicted. But to make such a judgement when between two sets of leads, with neither in line ahead and with just five or six minutes to go before reaching the 'point' of the cone in the Channel entrance required a high standard of vigilance, not only by the pilot but also by the Master. The effect of the start of the flood (east-southeast running) tidal stream was not detected early enough and, when it was detected, the wrong action was taken to counteract it by giving a small course change order of 5° instead of a helm order of at least 10° or 15°. Any large vessel which is just two minutes or so from a restricted channel entrance and needs a prompt course correction must have immediate and effective helm applied in order to achieve this. The giving of a course change order instead meant that the amount of helm applied and the rate of turn to the new course was left entirely to the choice of the helmsman, whose priority on this occasion was to avoid an excessive swing.

5.15 Clearly the pilot was alert to the danger that tidal streams do not always run as and when predicted and the tidal stream was predicted to start as the vessel entered the Channel. The surest indication of the start of a cross set would have been gained from the use of either the Outer or Inner Leading Lights. Had these leads been used, preferably the Outer Leading Lights, any deviation from the intended track would very soon have been apparent.

5.16 The prior preparation by the vessel's team of their own pilotage passage plan, as recommended in the IMO Bridge Procedures Guide and as required in Acomarit's Navigation Manual issued to their masters, was a regular routine for each port. The plan for Milford Haven provided for an approach to the West Channel entrance along the line of the Outer Leads, as described in the published sailing

directions. The vessel was already following this approach, on a course of 022°, when the Master received the request to go to the position southwest of Saint Ann's Head to embark the pilot. This meant a deviation to a northerly course.

5.17 The pilot boarding position for inbound vessels of the size and draught of SEA EMPRESS is stated in the sailing directions as being "*at various positions SW of Middle Channel Rocks Light appropriate to vessel's size and weather conditions*". Southwest of Middle Channel Rocks Light is generally west of the line of the outer leads, so it follows from this that the request from the pilot launch to the Master to go to the north to embark the pilot should not have been unexpected. Once the pilot had boarded and since the vessel had now left the line of the Outer Leads, the Master should have clarified with the pilot whether or not the vessel was to resume her original line of approach. He should also have shown the pilot the vessel's pilotage passage plan and discussed it. It is a well recognised duty of a bridge team to monitor the pilot's conduct of the navigation, a task made difficult if not impossible without prior knowledge of the pilot's intention and an agreed plan by which the pilot's action can be tested. Indeed, the Navigation Manual required that the vessel's plan was to be finalised "*after consulting the pilot as to his intended route and actions*"; it also required the Master to "*discuss the ship's proposed movements fully*" with the pilot and "*satisfy himself that arrangements and conditions were suitable, before allowing the ship to proceed*".

5.18 The Master had been to Milford Haven before, in about 1990 on a larger tanker, and in his opinion the correct way to approach the West Channel was to use the 022° Leading Lights; hence the prepared pilotage passage plan. He assumed the pilot intended to return to the 022° Leading Lights sometime before reaching the Channel entrance, although he had not asked him when this would be. It is speculated that had the vessel's prepared plan been implemented the accident would probably not have occurred. It can be seen from the reconstruction (see Figure 2) that the vessel did meet the line of the 022° leads before the Channel entrance, but at a point so close to it that only a substantial application of helm to port would have kept the vessel within the limits of the deepest water. The Master should have realised that the 5° course alteration ordered by the pilot was far short of the action needed, but he appears to have placed total confidence in the pilot's judgement. The Navigation Manual required that "*a strict watch must be kept to verify that the ship is handled and navigated correctly*". The Master evidently only became concerned when the vessel had crossed the centre 022° leads and was obviously going to pass very close to the Mid Channel Rocks Light Buoy.

5.19 The Chief Officer, who had not been to Milford Haven before, said that his usual duty in pilotage waters was to monitor the vessel's position and report the progress of the passage to the Master. However, he did not ask the Master what the pilot's passage plan was. He did plot the

position of the vessel six times after the pilot took the con and prior to the initial grounding, the last position being at 2006 hrs as the bridge was passing the Mid Channel Rocks Light Buoy. He took a further position just after the initial grounding, at 2008 hrs.

5.20 Prior to arrival off Milford Haven all the deck officers had attended a pre-arrival meeting with the Master on the bridge. This meeting, a routine procedure, was about all aspects of the vessel's arrival in the port, mooring at the jetty and discharge of the cargo. Discussion of navigational matters was included. The Chief Officer, like the Master, was satisfied that the vessel's pilotage passage plan included the correct line of approach to the Channel entrance. The Chief Officer was therefore under the impression, as was the Master, that the pilot was going to join the line of the Outer Leads at some stage before the Channel entrance was reached.

5.21 When the pilot ordered the succession of 5° course changes to port the Chief Officer was "not quite happy" since he had anticipated that the pilot would take the vessel nearer to the line of the outer leads before starting the turn to port. However he said nothing because he had been told that the preferred latest time to embark the pilot for berthing on that tide was 1930 hrs, whereas he had not boarded until 1940 hrs. The Chief Officer therefore assumed that the pilot was taking a compromise shorter course to the entrance to save time. Notwithstanding this, there was a failure of the Master to discuss the prepared vessel's approach plan with the pilot and finalise it with him, as instructed in the Navigation Manual. Whatever was decided should then have been made clear to the Chief Officer. This should have been done before the pilot took the con and need only have taken a few minutes.

5.22 Even if the vessel's prepared plan had been shown to the pilot, it is probable that he still would have preferred his own approach and that the Master would have accepted it. The pilot initially approached the Channel entrance steering what he considered to be a prudent course within the 'cone of safety' explained above. He did not explain his plan of approach to the Master after he boarded, probably because it was not the normal practice. Three of the pilot's senior colleagues, all of whom had an involvement in training him, said that they themselves did not normally tell Masters of inbound deep draught vessels which sets of leads they proposed to use and what specific courses they intended to steer towards the West Channel entrance. Many Masters, not just at Milford Haven, share a similar attitude, saying in effect "she's all yours pilot".

5.23 Merchant Shipping Notice M.854 titled 'Navigation Safety' provides advice on the planning and conduct of passages. It includes the following recommendation - "*ensure that the intentions of a pilot are fully understood and acceptable to the ship's navigational staff*". This Notice was published in 1978 and continues to be current. Although it is not

addressed to pilots, the pilot of SEA EMPRESS should have been aware of it, because written guidelines for the pilotage authorisation oral examination includes a knowledge of M Notices relating to pilotage. A knowledge of relevant M Notices is also in the oral examination syllabus for a Class 1 Certificate of Competency, which the pilot had obtained shortly before joining Milford Haven Pilotage Limited.

Effect of Squat

5.24 The deepest part of the entrance to the West Channel, which is near the middle, is only about 160 metres wide. Since the tidal streams run across the line of approach, even the weakest current strengths are enough to set an approaching vessel across and out of the deepest water unless adequate compensating action is taken. Any approach to this narrow entrance therefore calls for vigilant navigation and this is particularly so in the case of a large loaded vessel which has to be kept within the limits of the deepest water. Such was the case with SEA EMPRESS. The beginning of the east-southeast running tidal stream set the vessel some 115 metres towards the eastern limit of the Channel entrance.

5.25 SEA EMPRESS was drawing 15.9 metres when the pilot ordered 'full ahead'. By about 1955 hrs her engine speed was at 'full manoeuvring' and as she approached the Channel she was making approximately 10.5 knots. During the ten minutes prior to passing the entrance buoys she averaged 10.3 knots. It is estimated that at the time of the grounding one minute later the speed over the ground was approximately 10 knots. There would have been some squat as she left the deep water. As well as the slight reduction in speed, the squat would have caused an effective increase in the draught.

5.26 Squat effect increases with speed, initial draught and the closeness of the vessel's bottom to the ground. The phenomenon has been known about for many years and masters, navigating officers and harbour pilots are generally aware of it. An appreciation of squat is included in the written guidelines for the oral examination for pilotage authorisation. It was left to the individual trainee pilots to ask to see these guidelines; they were not issued to them as a routine practice. Research has been carried out and papers have been published, mainly by Dr I W Dand and Dr C B Barrass who have formulated means for estimating what the effect is likely to be for various conditions. Using the methods of estimation devised by Dr Dand, Dr Barrass and in "A Note on Ship Interaction Effects" prepared by the City of London Polytechnic, results of 0.65 and 0.83 metres were obtained. It is concluded that the increase in SEA EMPRESS's draught due to squat effect would have been about 0.75 metres immediately prior to the initial grounding.

5.27 Acomarit's Navigation Manual stated - "*When navigating channels of restricted depth, the effect of increased draught due to squat must be taken into account. It should be borne in mind that the effect increases with speed and is greater when the channel is also restricted in width*". The Navigation Manual also required the echo sounder to be run and this was being done, although the recorder was not being run continuously. With squat effect, the draught as the vessel crossed the 30 metre depth contour close to and west of the Mid Channel Rocks Light Buoy would have increased to about 16.6 metres. The height of tide at this time was 2.2 metres. The minimum charted depth over the rocky ground at the southwestern extremity of Middle Channel Rocks (which is just outside the charted limit of the Channel) is 13.7 metres, so there would have been less than 16 metres of water over those rocks at the time of the initial grounding. It is beyond doubt that the vessel, having narrowly missed the Mid Channel Rocks Light Buoy, 'clipped' these rocks, causing the bottom damage and breaching along the starboard side tanks. The position plotted at 2008 hrs confirms this. A depth survey carried out since the accident has found no uncharted obstruction or loss of charted depth in the West Channel entrance and there were more than adequate depths for SEA EMPRESS within the limits of the deepest water in the Channel entrance.

Action taken in Relation to the Initial Grounding

5.28 Consideration was given at an early stage in the inquiry to making an interim recommendation that pilots should use the Outer Leading Lights when bringing in vessels to the Haven via the West Channel. However, it was pointed out by MHPA that the Outer Leading Lights had been established only for use by VLCCs, that is vessels in excess of 200,000 deadweight tonnage (dwt). These vessels inevitably time their arrival off the Channel when the tidal stream is running fairly strongly to the northwest. MHPA suggested that it would not be appropriate to utilise this approach when the tidal stream is running in an easterly direction, which is often the case when tankers of less than VLCC proportions are entering the port.

5.29 It was therefore decided that this proposed recommendation should be held in abeyance until a computer simulation could be developed and exercises run to prove, or otherwise, the validity of such a recommendation. In conjunction with MHPA and a firm of consultants a simulator programme was developed. A number of simulations employing the characteristics of two tankers, one of 88,425 dwt and one of 133,855 dwt (slightly smaller than SEA EMPRESS), were run which demonstrated the feasibility of approaching the West Channel entrance on the line of the Outer Leads in both ebb and flood tidal stream conditions. Using this approach line has the added benefit that with the configuration of the Outer Leading Lights those on board are given a clear indication should the vessel be straying from the deepest part of the channel. Following on from this successful exercise an interim recommendation was made (see Section 22).

6. PILOTAGE MATTERS

Training and Authorisation of Pilots

6.1 There are no national or international standards for the training and authorisation of marine pilots. At the 1993 United Kingdom Pilots Association (Marine) (UKPA(M)) Delegate Conference, a resolution to lay down appropriate general standards was agreed. This resolution was followed by a survey of all UKPA(M) pilotage districts which revealed significant differences in both methods and standards of training. A brief policy document on the recruitment and training of marine pilots, based on the survey results, was then prepared and distributed in 1995 to many organisations. A Resolution inviting IMO to consider developing such standards was adopted at the 1995 Standards of Training, Certification and Watchkeeping Conference (STCW). It was considered by the Sub-Committee on Standards of Training and Watchkeeping in September 1996 and placed on that Sub-Committee's list of forthcoming work, so the development of international standards can be expected in the future. After the coming into force of the UK Pilotage Act 1987, responsibility for the training and authorisation of pilots at Milford Haven passed from the Milford Haven District Pilotage Authority to MHPA, which is a CHA, as defined in the Act. This came into effect on 1 October 1988 and the present system of training and authorisation dates from that time. Although MHPA is responsible for the authorisation and provision of pilots, the pilots themselves work for Milford Haven Pilotage Limited, a wholly owned subsidiary of MHPA. The income of the Pilotage Company comes from the charges made to vessels for pilotage services, the levels of which are approved by MHPA. The maximum number of pilots is thirteen as determined by MHPA. At the time of the accident there were twelve. Three pilots are on call in each 24 hour shift.

6.2 On the board of the Pilotage Company are two oil refinery managers, the Harbour Master, the Deputy Harbour Master, two of the pilots and a Chief Accountant/Secretary. There is no pilots representation on the board of MHPA. The training of pilots prior to their authorisation by MHPA is delegated to Milford Haven Pilotage Limited. New entry pilots, who are required to already hold a Certificate of Competency Class 1 (Master Mariner), undergo their practical training by making a minimum of 150 trips with an authorised pilot. At least half of these trips must be made at night. The trainee pilot then undergoes an oral examination ashore conducted by the Harbour Master, an unrestricted pilot and an independent mariner such as a retired shipmaster.

6.3 The written guidelines for the pilotage authorisation oral examination covers a number of subjects on which knowledge is tested. These include information shown on the local charts, local tides and tidal streams, shore navigational aids, pilotage inwards and outwards through the East and West Channels, bridge management and

M Notices relating to pilotage. After passing this examination, the pilot is authorised to conduct the pilotage of any vessel up to 30,000 dwt. Subsequent authorisations for larger vessels are on a time served basis of one year's service between each level of authorisation, the progressive levels being: up to 90,000 dwt, followed by up to 150,000 dwt, then any size up to a maximum draught of 18 metres and finally unrestricted which covers vessels of any size and draught. They are granted with no required minimum number of trips on the larger class of vessel and without further examination. However, consideration is given to the number of trips made and the pilots performance during the year before the next level of authorisation is granted.

6.4 The pilot of SEA EMPRESS was aged 33 at the time of the accident. He had no health or domestic problems and was not fatigued, having carried out only one other pilotage (during the morning) after a normal night's sleep at home. He had a sight test in 1995 and required spectacles for near vision but did not require them for distant vision. The pilot had obtained his Certificate of Competency Class 1 in May 1991 and joined the Pilotage Company in October 1992. He had no previous tanker experience. After completing the 150 trips accompanying other pilots he was examined for authorisation to pilot vessels up to 30,000 dwt, on 14 December 1992. He was successful and on the recommendation of the Harbour Master the Port Authority issued him with the appropriate authorisation with effect from 22 January 1993.

6.5 During the following year the pilot worked on his own within the limits of his authorisation, but occasionally he also accompanied other pilots on tankers over 30,000 dwt with a view to authorisation to pilot vessels up to 90,000 dwt at the end of that period. However, by January 1994 he had only made seven training trips on larger vessels, just one of which was an inward passage from sea. It was mutually agreed that the pilot had not gained sufficient experience to pilot larger vessels, and the required authorisation was deferred. However, at his request, his authorisation was extended to include vessels of 60,000 dwt to give him greater experience of tug work, as this is very limited with vessels below 30,000 dwt. He then made a further 19 training trips, seven of them inward passages from sea; his experience on the larger vessels was now considered adequate and in May 1994 he was authorised to pilot vessels up to 90,000 dwt. During the next year the pilot made seven training trips on vessels over 90,000 dwt, five of which were inward passages from sea. On 26 May 1995 he was authorised to pilot vessels up to 150,000 dwt.

6.6 MHPA records show that from the date of his authorisation to handle vessels of up to 150,000 dwt, up to the time of the accident the pilot had performed four acts of sole pilotage and one as assistant pilot on vessels of over 90,000 dwt. All of them were through the West Channel, however, only two of those acts of pilotage were on tankers of over 100,000 dwt on inward passages from sea.

6.7 It is evident that the arrangements for the training and authorisation of pilots at Milford Haven are unsatisfactory and need to be improved. The qualifying requirements to pilot vessels in excess of 30,000 dwt should be based upon agreed minimum numbers of trips, minimum proportions of which should be inward trips from sea, during daylight and during hours of darkness respectively. There should be an examination before authorisation is granted for each size of vessel, not just for initial authorisation as is now the case. There should be a practical examination as well as an oral examination. The additional oral examinations could continue to be conducted ashore and include changes or developments in the port relevant to pilotage since the pilot was previously examined. The practical examinations should be on board during working trips, with the examiner observing the candidate to assess his competency. Simulators are a valuable aid for the training and examination of pilots where a wide range of simulated emergencies can be readily introduced. Pilots must be trained to deal with the unexpected and show through examination that they can cope with any situation.

6.8 The choice of deadweight capacities to define the four levels of authorisation was chosen (with tankers in mind) because deadweight gave a direct indication of the size of the vessel as well as the amount of cargo at risk. However, that was on the assumption that all the oil tank capacity in the vessel was available for cargo or fuel. Since the coming into force of the International Convention for the Prevention of Pollution from Ships (MARPOL) requirements for segregated ballast tanks this is no longer the case. Some tanks which previously were available for cargo must now carry only ballast.

6.9 SEA EMPRESS has segregated ballast tanks with capacities totalling about 50,000 tonnes which, had the vessel been built before the requirements came into force, would have been available for cargo. Consequently, a 150,000 dwt tanker today has a similar total tank capacity to that of a 200,000 dwt tanker before the MARPOL requirement for segregated ballast tanks came into force. The loaded draught is less but the length and beam are similar. It follows from this that pilots who have only been authorised for vessels up to 150,000 dwt, for example, may be piloting tankers of a size where the higher authorisation would originally have been required. It has also been the agreed practice at Milford Haven to provide two pilots to tankers over 150,000 dwt (as SEA EMPRESS was less than 150,000 dwt this requirement did not apply to her). However, in the context of pilotage into the West Channel at Milford Haven, the Inquiry considers that loaded draught is a more important factor than extreme length or beam.

NB : Since the incident MHPA have amended the pilotage rules and two pilots must now be taken by vessels of 65,000 gross tonnage and above. This equates to about 120,000 dwt.

Management of the Pilots

6.10 Prior to the coming into force of the Pilotage Act 1987 (which succeeded Pilotage Acts of 1913 and 1983) pilots were authorised by a district pilotage authority which was not required to be, and usually was not, part of the port authority. The best known pilotage authority was Trinity House which authorised pilots for the Port of London district and some forty other districts around the United Kingdom, including Milford Haven. Many pilots were self employed, as were those at Milford Haven. Since the 1987 Act, with the port or harbour authority now responsible as the CHA for the provision of pilotage services, pilots became answerable to CHAs through harbour masters, many of whom had no pilotage experience in their harbours. Such was the case at Milford Haven. Although Milford Haven Pilotage Limited was formed to employ the pilots, matters of authorisation and discipline remained with MHPA as required by the Act. Also the charges for pilotage are made by Milford Haven Pilotage Limited and the tariff is set by them, with MHPA approving the tariff.

6.11 From quite an early stage in the Inquiry, it was evident that there was a deep rift between MHPA management and the pilots. For example the present Harbour Master (who earlier in his career had served as an authorised pilot for vessels up to six metres draught in the Thames Estuary area) was appointed in 1995; after taking up his new post he expressed the wish to accompany the pilots during pilotage operations to familiarise himself with local pilotage practices. Although he did accompany them on a couple of occasions there was opposition to this by the pilots and no further trips were undertaken. MHPA as the CHA is fully responsible for the provision of competent pilots and this was clearly a most unhealthy situation. Also during the salvage operation it was apparent that at times communications between the pilots and the Harbour Master was far from good.

6.12 The view of the pilots is that their employer, Milford Haven Pilotage Limited, has no power or influence within MHPA. They attributed the initial grounding of SEA EMPRESS, in large measure, to MHPA's alleged failure to properly train pilots after 1988 (when they became the CHA). However, apart from the regulatory functions of authorisation, discipline and approval of charges, aspects of the training and management of pilots were from 1988 delegated to Milford Haven Pilotage Limited. In the pilots' opinion, the management of MHPA is more interested in reducing standards for cost reasons than maintaining them for safety reasons. Conversely, a member of the management of the CHA has described the pilots as being a law unto themselves, while MHPA accept that in practice pilotage is controlled by the pilots because of their monopoly of unique knowledge. Such views show that the relationship between the pilots and the management of MHPA needs to be improved upon.

6.13 The Pilotage Act 1987 gave CHAs the absolute right to determine the standards of training and authorisation of their pilots, whether or not those responsibilities were delegated, with no mechanism to challenge their judgement of what those standards should be. This is quite unlike the training and certification of ship's officers where minimum national and international standards do exist. This is not a satisfactory situation, when inadequacies in the training and experience of the pilots might only be detected after an accident has happened.

6.14 The forming of a separate 'pilotage company' with the coming into force of the Pilotage Act is not unique to Milford Haven. This was also done in some other CHA areas. It is considered that there is a strong argument in favour of abolishing these pilotage companies so that the pilots become direct employees of the CHA (the harbour or port authority) and directly managed by them on a day to day basis. Instead of keeping the pilots at arm's length, which seems to be the practice now, the pilots should be brought into the team.

7. PORT RADAR

7.1 In 1973 Milford Haven was first provided with a radar installation which covered the whole harbour area by suitably placed scanners, monitored by the duty officer in the port signal station. Its usage included the monitoring of the positions of the entrance buoys and the entry into the harbour of every large tanker. Coverage for this was from the scanner mounted on Saint Ann's Head. The original installation eventually required replacement and a new system was installed in 1985. This system ran successfully with upgrading until late 1994, when its operation became erratic. MHPA budgeted for a replacement system in 1995, the study for the new system being initiated in January of that year.

7.2 Progressive failures then occurred and by October 1995 coverage at Saint Ann's Head and Great Castle Head had been lost. Unsuccessful attempts were made to return the equipment to an operational state. In November 1995 approval was given to expend £100,000 on new radar equipment at Saint Ann's Head. Tenders for this work were received in January 1996. Later that month revised expenditure of £150,000 was approved for the equipment at Saint Ann's Head. Approval was also given for the phased replacement of the rest of the system as soon as the necessary technical evaluation and tendering could be completed. The contract for a new radar system was finally let on 16 February 1996.

7.3 The period of about a year when large loaded tankers were entering this major oil port with no effective and reliable radar monitoring is clearly unsatisfactory. But what needs to be asked is would radar monitoring, had it been in operation, have helped to avoid this particular accident? If there had been a standard agreed line of approach to the West Channel entrance, for example using one or the other of the 022° and 040° leads, then any significant deviation from either of those lines of approach would have become apparent on the radar and warning could have been given to the pilot. However there was no agreed line of approach (except for VLCCs when the 022° leads would be used during a particular tidal window).

7.4 As there was no agreed track it would have been impossible for a watch officer monitoring the radar to warn the pilot since he would not know what the pilot's intended track was. As the vessel closed with the Channel entrance, a set by the tide towards one side or the other would probably not have been apparent on radar unless the bearing and range discrimination was unusually good. In any case it is unlikely that warning given at such a late stage in the approach to the entrance, probably less than half a mile from it, would be timely enough to avoid a grounding in the entrance. It is considered that the existing radar installation, had it been operational and manned, would not have prevented this grounding.

8. COASTGUARD MANNING AT MILFORD HAVEN

8.1 HM Coastguard is one of two divisions of The Coastguard Agency. Through six regions covering the UK coastline, the Coastguard maintains a 24 hour radio listening watch and co-ordinates search and rescue operations at sea and along coastal shorelines. Each region has a Marine Rescue Co-ordination Centre (MRCC) to which each of a number of Sub-Centres (MRSCs) reports. Milford Haven is within the Western Region and the MRSC there reports to the MRCC at Swansea. The Milford Haven MRSC building is situated at Hakin, about a mile west of Milford Haven town. It is adjacent to the MHPA building and overlooks the eastern part of the Haven.

8.2 The prime role of HM Coastguard in any emergency situation is to co-ordinate search and rescue actions with the aim of saving life. Another important aim is to minimise pollution from ships. At all MRSCs the watch is normally kept in the Operations Room by a senior watch officer and two watch officers. Each officer is seated at an individual console from which he or she can use all the means of communication, including VHF radio and land telephones. After an incident has occurred, all significant events are brought to the senior watch officer's attention and he makes decisions on actions to be taken, such as the alerting or tasking of the various rescue services and also, where pollution is a probability, the alerting of MPCU (the other division of The Coastguard Agency).

8.3 During the evening of 15 February the Operations Room of Milford Haven MRSC was manned by three qualified officers. The minimum required manning is two regular qualified officers and an auxiliary officer, so the level of manning was above that normally required. The initial VHF transmission from the pilot to the harbour tugs was monitored and timed at 2007 hrs. HM Coastguard immediately alerted MPCU of the incident.

8.4 After initially alerting MPCU to the incident, HM Coastguard worked closely with MPCU monitoring the safety of personnel on the vessel and assisting in many other ways including the supply of helicopters for emergency evacuation.

8.5 Reports made public shortly after the incident that Milford Haven MRSC was undermanned and that this contributed to the causes of the pollution are without any foundation of fact.

9. ESCORT TOWAGE

9.1 Public concern has been expressed that no tug escorts were being provided for large tankers entering Milford Haven and that had SEA EMPRESS been given one, the grounding might have been avoided. The harbour tugs used for berthing usually meet inbound tankers near the Chapel Buoy, which is three miles inside the Haven entrance. These tugs are not intended for work outside the Haven and in any case none of them has sufficient power for an escort role. Loaded tankers approaching the West Channel (including VLCCs) do so at a speed of about 10 knots so as to minimise the effect of the tidal streams setting across the entrance. An escort tug would therefore need the capability to maintain such a speed with adequate propeller immersion in a sea area exposed to strong winds and heavy sea and swell conditions.

9.2 The basic purpose of an escort tug is to accompany the escorted vessel during its passage and, if the need arises, provide prompt assistance to avoid an accident and consequent pollution. The escort tug may run with the vessel without making fast to it (passive escorting) or may be connected by a tow line with or without weight on it (active escorting). Active escorting has the obvious advantage that the tug can start to assist with the minimum of delay. Specialised escort tugs are designed to connect to the stern of the vessel and run with it at speeds in excess of 10 knots, usually with no weight on the tow line. However, the extreme upper limit at which conventional tugs can safely intervene is considered to be 6 knots. If way needs to be taken off the vessel urgently, the tug manoeuvres to put weight on the tow line and render a braking effect or assist the rudder effect of the ship. The mooring bitts of most existing ships would be of insufficient strength to accept the consequent stresses, but the Emergency Towing Point, an IMO requirement for large tankers from 1999, could be adapted for escort towage use.

9.3 It is extremely doubtful if the presence of an escort tug, even an 'active' one, would have helped to avoid the initial grounding of SEA EMPRESS. This is because neither the pilot nor the Master recognised that all was not well until it was too late. The master of an escort tug would not have been aware of what course or helm orders were being given on the bridge of SEA EMPRESS and he certainly would not have taken action without specific orders to do so. By the time it was recognised that the course change order was inadequate, SEA EMPRESS was already within two minutes of grounding and, in these circumstances and within the time constraint, nothing an escort tug could have done would have averted it.

9.4 However, the assistance of an escort tug might have avoided the second grounding. SEA EMPRESS still had considerable ahead momentum after the initial grounding across the edge of Middle Channel Rocks despite the frictional resistance of the rocks, the use of astern power on the main engine and the deploying of the anchors. This momentum was sufficient to take the vessel across the 'pool' until she grounded again south of Mill Bay Buoy. An escort tug, if secured to the stern and manoeuvred as described above, could have exerted an effective braking force, perhaps from shortly before the initial grounding, which might have been enough to hold the vessel in time to avoid the second grounding. Consideration therefore should be given to the use of an escort tug for inward passages of large tankers. Various preliminary studies into the introduction of escort towage at Milford Haven had in fact been in progress since 1995. After the SEA EMPRESS incident MHPA commissioned consultants to conduct a full feasibility study, the findings of which were in favour of escort towage.