**The Arrival of the Emma Maersk at Felixstowe**
**04 November 2006**


In 2004 the Danish container ship operator Maersk Line, announced its intention to introduce a new class of vessel of approximately 400m in length which it was intended would call at the Port of Felixstowe. This prompted Harwich Haven Authority to draw up a series of measures to ensure that the port was prepared for the arrival of these vessels, and that pilots were appropriately trained to handle this much larger vessel. Amongst these measures was the creation of a separate category of pilots to undertake the pilotage of these vessels, SCS (Special Category Ship) Pilots, as well as the introduction of a series of ship simulations to be undertaken at the premises of HR Wallingford.

The initial ship simulations were conducted with very limited information. Dr Ian MacCullum of HR Wallingford prepared a set of 'pseudo data' based on the known characteristics of the ship. Quite simply this amounted to, L x B x draft and an assumed $C_b$ of around 0.70, with the added complication that a decision on the final width of the vessel, had not been made. This simulation concentrated mainly on the proposed Felixstowe South berths with only two runs to the existing Trinity Terminal 7 berth. The simulation was valuable in that it gave the participating pilots a 'feel' for the different handling characteristics of this type of vessel but did not give an indication of the likely parameters for Trinity Terminal 7. A significant recommendation arising from the simulation was that the tug fleet needed to be upgraded to at least 3 x 60t and 1 x 40t tugs and ideally with 4 x 60t tugs from the existing fleet of 2 x 60t and 2 x 40t.

Previous arrivals of 'new class' vessels had presented opportunities to join the vessel at her previous European port of call in order to familiarise the pilot with the vessel before arriving at Felixstowe. As **Emma Maersk** was on the AE1 service, Felixstowe was a port of call direct from the Far East on the inward leg, no call was made on the outward leg, this posed a problem. When **Emma Maersk** was nearing completion attempts were made to obtain greater detail about the ships handling characteristics. It became imperative that an attempt be made to gather more information. Accordingly my colleague Mr. Ian Simpson made arrangements with the Rotterdam Pilots, with the approval of Maersk Line, to board the vessel at Rotterdam for the inward passage and to also witness the departure.

During this visit Mr Simpson was able to make a series of observations and record data which was passed on to Dr Ian MacCullum of HR Wallingford. This data included figures for the length of the parallel mid body, which was just over 30% of the vessels overall length. With this additional data Dr MacCullum was able to refine the data used for the 2004 simulation and create an updated ship model. This ship model was used in a two day ship simulation at HR Wallingford which was attended by the pilots who were to participate in the pilotage of the initial call as well as the two tug masters who would command the two tugs to be employed. The simulation was deemed to be successful giving all participants the confidence to handle the vessel as well as refining the arrangements required for the deployment of the tugs. From the information received about the limited parallel mid-body it was clear that any tug attachment would have to be at bow and stern, and arrangements were made to undertake training for tug masters to achieve bow pick up at 5 knots, this had not been a manoeuvre that had been undertaken previously with ASD tugs.

During the period of some 18+ years which Maersk Line vessels have called at Felixstowe we have seen a steady increase in vessel size, in some cases incremental, in other cases dramatic. From the Panamax M Class vessels introduced in 1985 to the E Class vessels of today there has been a steady increase in ship size and displacement which the following table illustrates;

| **Vessel** | **Year Built** | **Length (m)** | **Beam (m)** | **Displacement** | **TEU** |
|---|---|---|---|---|---|
| | | | | | |
| M Class | 1985 | 295 | 32.30 | 86000 | 4500 |
| K Class | 1993 | 318 | 42.80 | 118000 | |
| S & C Class | 1995 | 347 | 42.80 | 129000 | 8500 |
| A Class | 2001 | 352 | 42.80 | 131000 | |
| G Class | 2005 | 367 | 42.80 | 137000 | 10000 |
| E Class | 2006 | 397 | 56.40 | 208000 | 14500 |
| | | | | | |

Thus in 20 years, length had increased by approximately 30%, beam by 75% and displacement by 250%, a significant increase. The 'windage' in the full load condition amounts to 14500$m^2$ equating to a wind force of approximately 278 tonnes in 35 knot beam winds, this means that these new vessels are going to be a significant challenge. With thrusters fore and aft developing 50 tonnes each (100 tonnes total) this means that 3 x 60 tonne tugs would be barely adequate to control the ship, and that a combination of 3 x 60 and 1 x 40 would give a margin for control of around 40 tonnes. It was this information that drove the recommendation for the minimum tug

fleet. A few months prior to the first call the first of a new series of tugs were introduced, developing 70 tonnes BP, thus allowing for the replacement of one of the 40 tonne tugs. A second 70t BP tug is scheduled to be introduced by mid 2007.

**Emma Maersk** arrived at the pilot station 5 miles to the east of the Sunk LV at 1430 UTC on 04 November 2006 and was boarded by Pilots A C Adams (Charge), R Graham (Second pilot) and S Davey (Observer). It was agreed with the Master that there was time to conduct one full turning circle trial in order to validate the mathematical model at HR Wallingford. Trials were completed at 1510 and the vessel then commenced her inward passage to Felixstowe. Mindful that we were approaching low water and that the vessel had a draft of 12.5m and channel depth was 14.5m, speed was kept at 'half ahead' giving a nominal speed through the water of 12kts. With full helm and half ahead the rate of turn at the S Shipwash was observed to be 16° per minute

Transit of the outer channel was uneventful. When the ship entered the Harwich Channel speed was reduced progressively from 5/6 buoys with the intention of having a speed of 7-8 knots by the time the vessel was at the Platters buoy. The first tug, the escort fitted **Adsteam Shotley**, was made fast in the aft centre lead prior to the Platters Buoy. Some initial difficulty was experienced in negotiating the 90° turn into the harbour but this was overcome by the use of the **Shotley** operating in the indirect mode. The successful deployment of **Shotley** in this manner was the direct result of planning and consultation between tug masters and pilots both prior to and during the simulation period.

When inside the harbour problems were experienced in attaching the forward tug. This was due to an inability to pass the heaving line first time due to the high bow height and meant that the tug was a long time under the bow of the ship and had to come in for a second attempt which was a far from ideal situation. This difficulty occurred despite the crew having been briefed about the necessity of using a weighted line. Quite clearly this is an issue which will have to be addressed.

When approaching the swinging ground speed was progressively reduced by use of the after tug in the 'astern' mode. Speed was down to 2.5kts before the engine was used to stop the vessel, this is some 2kts lower than is the case with existing vessels. The rate of turn during the swing was 15 degrees which compares with the 13 degrees achieved in simulation. The vessel was turned with aid of tugs and thrusters before making a sternboard to the berth at No.6. The ships sternway was controlled by the forward tug such that there was very little requirement for an ahead engine movement. When the vessel was parallel to the berth at about 120m the thrusters were employed to bring her to her berth, with tugs supplying fore and aft movements as necessary to avoid the use of main engine. There appeared to be no significant problems, but the speed was much lower than is the case for earlier vessels. The vessel was successfully berthed at 1810. Concern that the ship would take a long time to secure (typically 40 minutes based on observations made in Rotterdam) due to low manning levels (3 men each end including an officer), proved unjustified, the mooring operation taking about 25 minutes. This increase in performance from that observed by Mr Simpson is almost certainly due to practice and experience gained whilst the vessel was in the Far East

The very small amount of parallel mid-body means that when the vessel is berthed, very little of the ship is resting on the fenders. At Felixstowe this means that only four or five fenders are bearing the weight of the vessel. We are assured that this is not a problem from an engineering point of view. In other ports the fender spacing is even wider than that at Felixstowe leading to problems with the vessel 'pivoting' on the fenders. Another problem with the limited parallel mid-body and the fine hull form ($C_b$ 0.62) is that a relatively small offset from parallel means that the bow or stern can overhang the quay bringing the vessel into close proximity with the cranes. It is therefore essential that the vessel be brought alongside absolutely parallel. As a risk mitigation measure we have requested that cranes are parked beyond the ends of the vessel in her final berthed position. The ships bridge projects above the crane booms by several meters and this means that the bridge wing is close to the hinges of the boom (1.7m) again care has to be taken when moving cranes past the vessel.

Forward vision due to the high bridge structure and midships placement is excellent and one is not aware of the size of the vessel when looking forward. It is only when looking astern that you realise that there is as much behind as there is in front. The vessels acceleration and deceleration is slower than for existing vessels, a fact which was indicated during simulation.

This vessel is a significant step change from any existing vessel calling at Felixstowe. Pilotage of this ship is challenging and non trivial but within the capabilities of the pilots selected for the task. The arrival and departure was conducted in relatively benign conditions, it remains to be seen how the vessel will handle with winds at the upper limit recommended by the risk assessment. We have concluded that it is essential that any pilot appointed to this class of vessel should have undertaken simulation training, it is not sufficient to have merely 'tripped' with another pilot.

The vessel departed at 0500 on the 6th November, two tugs were employed, both of which were retained until successfully negotiating the Beach End turn, after which the passage was completed without incident. We await the arrival of the other vessels of the class in due course.

A C ADAMS