ENHANCEMENT OF SAFETY CULTURE IN
HARBOUR PILOTAGE AND TOWAGE ORGANIZATIONS

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ABSTRACT
The most important question for the pilotage and towage service is; what measures could be taken in order to achieve the most effective outcomes, and with the lowest possible risk values, from the pilotage services within the area it has been authorized for? While searching for a favorable response to the above quoted question, the following factors have been taken into consideration.

- Protecting the social rights of the stakeholders inhabited within the area where pilotage services are being carried out (in the name of the prevention of sea and environmental pollution; providing employment opportunities and economic infrastructural investments for the area in question).
- Meeting the demands from the ships rendered pilotage services and the private jetties benefiting from this service, in accordance with the social accountability principles of the company.
- Evaluating the professional knowledge, skills and experience of the human resources such as; pilots, tug staff and mooring crew and thus identifying the safest means for the operations to be carried out by human resources.

UZMAR Pilotage and Towage Organization, as an authorized pilotage and harbour towage organization in Turkey, has launched a comprehensive project, namely “A Study on the Enhancement of Safety Culture in Harbour Pilotage Towage Organisations”. The basic driving force and purpose beneath this initiative is to promote and improve the already established and implemented organizational safety culture and the situational awareness. UZMAR strongly has the faith in such an academic proactive approach and study, supported by the Dokuz Eylul University-School of Maritime Business and Management, and will definitely contribute to the achievement of the overall maritime safety objectives both on the national and global level.

The phases of the study attempted, considering the above mentioned aims are highlighted in the following parts:

- Situational Analysis of the Physical Conditions of the Piers and Jetties in the Nemrut Bay,
- Risk Assessment of Ship Manoeuvring by Harbour Pilots in the Nemrut Bay,
- Code of Conduct and Best Practices for Harbour Pilots,
- Organizational Perceptions of the Employees.

By this project; the required safety measures are determined, through any means of triggering “expectations”, in accordance with the risk evaluation results and with restrained budgets. The study carried out within such concerns enabled us to determine the threats and specify the safety measures to be taken against the threats defined. In a sense, this study provided us with a map to be followed. Only after this specific step, was it realized that certain statistical data concerning the defined threats was inevitable. The “map” mentioned through the risk evaluations to be carried out periodically in compliance with the data gathered was then decided to be updated.

Keywords: Harbour Pilotage  Safety Culture, Risk Assessment, Code of Conduct,

1. INTRODUCTION AND BACKGROUND
Efficient and safe ship handling, the profession of a harbour pilot, requires an adequate personal capacity to cope with complex situations known as the situational awareness (Clarke; 2001). Dr. O’Hare (1997) has studied and researched situational awareness in some details. According to his definition, situational awareness is the ability to: attend to multiple information sources, identify alternatives, establish priorities, estimate probable outcomes for different actions, work on whatever has highest momentary urgency without losing sight of the routine, reorder priorities as situations deteriorate or improve, and act decisively in the face of indecision by others. Coupled with experience and suitable technical knowledge, the above list probably comprises the wish list for the abilities required in a good shiphandler.
Captain Pelecanos (2003) stated that commercial pressure on the harbour pilots are source of stress. These may be in form of request to use fewer tugs or berth/un berth within certain time-frames or obliging approach to certain piers. It is undeniable that such obligations and the resultant stresses are likely to increase exposure to risks, affecting the decisions made by harbour pilots. Another point likely to affect the level of stresses suffered is the diversity in the level of experiences the pilots have. It would not be logical and fair to expect a relatively less-experienced pilot to carry out certain challenging maneuvers which could be managed only by well-experienced pilots. Nor would it be affordable to employ and keep at instant accessibility a well-experienced pilot just in case any over challenging maneuvering might be required. Therefore it would be more reasonable to determine certain standards concerning the safely manageable maneuvers each pilot could achieve, which would provide managing overall safe maneuvering.

The very first practice of private pilotage activities at the region of Nemrut Bay dates back to 1994. Since then, a great deal of infrastructural investment has been carried out at this region with the aim of further widening, dredging including various further physical improvement operations; and eventually the Bay has owned today a port with an infrastructure of 6 jetties with 35 individual berths. Besides as a favorable reflection of such effortful practices, the traffic at the Bay has reached a remarkable growth. Figure 1 shows the annual statistics regarding the pilotage services rendered by UZMAR in the Nemrut Bay. The traffic has grown so much that while only a few pilotage maneuverings a day used to be practiced in these early days of the Bay, recently this number has reached as high as 30 ship maneuvers a day. In such an appreciable performance, 2 senior pilots, 10 pilots, 24 tug staff and 24 other staff are involved, excluding the UZMAR head office staff.

![Figure 1: Annual Data on the Number of Ships Rendered Pilotage Service in The Nemrut Bay](image)

2. AIM OF STUDY

The remarkably increasing number of ship calls and the pressurizing commercial demands of the private jetties on the safety factors of ship handling in the pilotage and towage area has urged UZMAR to review and code its applicable “best practices” within the framework of its organizational safety culture. The aim is to render pilotage and towage services in the most effective and the safest manner, making the best use of the facilities available in hand, following a proactive approach and taking into account the requirements received from the relevant stakeholders. Within the scope of this sophisticated aim, seeking the most satisfactory response the following basic question, likely to be the cornerstone of the crucial target, has acted as a trigger for this study:
“What measures could be taken in order to achieve the more effective outcomes and with the lowest possible risk values, from the pilotage services rendered by UZMAR Pilotage Organization within the area it has been authorized for?”

3. METHODOLOGY OF THE STUDY
Setting sails with the structured focus group brainstorming sessions held by the attendance of their in-house harbour pilots, company managers (ex-ship masters), tugboat masters and academics, they have compromised - with a strong commitment - on the fact that “we really need to do this study and it will really help us”, and then decided upon “what we need to do” and “how we will do them”. Also in all phases of the study, different methodologies are used. Detailed information of methodologies were explained in the their phases.

The first two stages of the study, which were already completed, are “Situational Analysis of the Physical Conditions of the Piers and Jetties in the Nemrut Bay” and “Risk Assessment of Ship Maneuvering by Harbour Pilots in the Nemrut Bay”. The outcomes will be reported to the Harbour Master and the terminal operators, as the public and private shareholders, with the aim of better co-operation and co-ordination in the name of enhanced safety.

4. Situational Analysis of The Physical Conditions of The Piers and Jetties in The Nemrut Bay
The study comprises thorough scrutiny and evaluation for each individual pier with the aim of determining the actual physical conditions. The data required to reveal the physical conditions of the piers have been provided from the below listed sources. The meetings held for collecting research data have taken around 200 manhours. The sources from which the data was collected are as follows;

- The feedback reported by the shipmasters to the pilots with regards to the physical conditions
- The evidences experienced by the pilots and mooring and tug personnel
- Focus groups where Nemrut pilots altogether attended

The physical shortages and deficiencies found out with the piers have been coded and analyzed. The data gained then was gathered in certain meaningful groups. These groups have been used to interpret, compare, contrast and evaluate the physical deficiencies of the piers under a common scale (satisfy, shortages, unsatisfy) The groups categorizing the deficiencies mentioned are listed as follows;

1- The pier lengths available for ship moorings and sheltering.
2- The casual aging and structural loss the piers are exposed to.
3- The quantity and adequacy of the fenders available at the piers and their physical conditions.
4- The quantity and adequacy of bollard available at the piers and their positions and physical conditions.
5- The impeding effects of the cargo handling equipments and devices positioned at the piers on ship maneuvering
6- The adequacy of lighting facilities at the piers
7- Navigational safety equipments available at the piers
8- The impeding effects of the ships moored at the berths on pilotage maneuvering.
9- The impeding effects of the under water obstructions on navigation and pilotage maneuvering
10- The facilities enabling the mooring staff to embark the piers from the sea and carry out their tasks.

The outcomes of the evaluation was reported by the UZMAR Pilots and presented in a meeting where the Aliağa Harbour Master was also present. Following this presentation, the Aliağa Harbour Master investigated on the spot the deficiencies of the piers pointed out in the report and instructed the jetties managements to take corrective actions.

5. RISK ASSESSMENT OF SHIP MANEUVERING BY HARBOR PILOTS IN THE NEMRUT BAY
The admirable fact that Nemrut Bay has so far suffered no accidents of significance could be attributed to the safety culture UZMAR Pilotage Organization has well internalized and the noticeable wealth of experience its pilots have gained. On the other hand, due to the vessel traffic boomed at the Bay, supplemented with the fact that a great deal of new construction and renewal operations are carried out, coupled with the threatening existing deficiencies suffered with physical conditions of the piers have naturally raised the risk levels to be encountered. Hence with the aim of identifying the threats likely to be encountered in the region and determining the likely levels of risks, “perceptual risk evaluation” (Kuo, 1998) has been used in this study.
Hazard or threat identification consist of determining what type of accident could affect the ship activities under consideration using brainstorming techniques involving trained and experienced personnel (Billington 1999). The study of “perceptual risk evaluation” was realized through 10 focus group meetings held with the attendance of 10 UZMAR pilots. Within the study, the threats related with each individual pier were defined with brainstorming techniques. It has been found out that no data has been gathered so far about the probabilities of the incidents and consequences of the hazards defined (there has been no accident suffered or reported); neither have any incidents (near-misses) that could have turned into accidents been recorded. That’s why, the study included perceptual measurements concerning the probabilities as well as the consequences of accidents. In cases where available data are inadequate, expert judgment is used to assign frequency and consequence ratings. It will be found important to devise scales, particularly for frequency (probability) which have an easily grasped meaning within the expert’s direct experience (Billington 1999). Such perceptual investigations were carried out on the shift-change days when all the pilots were present. This study of “perceptual risk evaluation”, that was realized in a kind of focus group meetings, took a total of about 300 manhours.

Risk assessment study started with the evaluation tables, titled “Defining the Threats of the Ship Maneuvering and the Risk Assessment Tables” which included the risk evaluation data for each of a total of 35 piers at 6 private jetties in the Nemrut Bay. Threats for each pier were defined. The sources and the intensities of the threats were perceptually measured. Sources and intensities of threats were determined by Uzmar pilots as

“meteorological conditions”,
“pilottage errors”
“ship deficiencies”

The measurement was based on the result of the evaluation which received an unanimous approval from all the pilots. Table 1 indicates a sample part of the study.

Table 1: Defining the Threats of the Ship Maneuvering

<table>
<thead>
<tr>
<th>No</th>
<th>DEFINITION OF THE THREAT</th>
<th>Source of Threat and Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Effect of Meteorological Cond.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low &lt; --- &gt; High</td>
</tr>
<tr>
<td>1</td>
<td>Contact with the ship alongside</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>2</td>
<td>Hard breasting/Collision with quay</td>
<td>x</td>
</tr>
</tbody>
</table>

The probability scale of the incidents likely to appear was perceptually evaluated based on a through discussion with the pilots and established as “very rarely” (once in 20 years), “rarely” (once in 10 years), “occasionally” (once in a year), “frequently” (once in half a year) and “very frequently” (once in a month). As for the consequences anticipated, the figures reached through a perceptual evaluation carried out with the pilots were as follows: over USD 100 mil. “catastrophic”, over USD 10 mil. “hazardous”, over USD 1 mil. “major”, over USD 100,000 “minor”, and over USD 10,000 “little”. The relevant risk evaluation is indicated in Table 2.
Table 2: Evaluating The Consequence and Probability

<table>
<thead>
<tr>
<th>JETY</th>
<th>EGE GÜBRE</th>
<th>CONSEQUENCE OF THE HAZARDS</th>
<th>PROBABILIT OF THE INCIDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BERTH NUMBER</td>
<td>4</td>
<td>10,000 USD</td>
<td>100,000 USD</td>
</tr>
<tr>
<td>No</td>
<td>DEFINITION OF THE THREAT</td>
<td>Little effect</td>
<td>Minor effect</td>
</tr>
<tr>
<td>1</td>
<td>Contact with the ship alongside</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Hard breasting/Colission with quay</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Following the risk evaluation studies for each pier, the threats likely to appear in the maneuvering basin were defined. In the risk evaluation studies on the defined threats the previously explained procedure was followed. The third phase of the study comprised the transfer of all the threats defined and related risk evaluations to a risk matrix which is indicated in Figure 2.

![RISK MATRIX](image)

Figure 2: Risk Matrix of The Threats
In the risk matrix, the unacceptable risk zone is marked red. The threats likely to appear within and close to the unacceptable zone were listed. Later on, taking every single listed threat into consideration, the relevant risk reduction measures were identified and grouped in three different application methods namely “the managerial”, “the engineering”, and “the operational” as defined in the previous literature by Kuo (1999). Such risk reduction measures were the unanimously compromised outcomes of the comprehensive focus group meetings held with the attendance of the pilots and the company top management officials. The discussions have not been finalized yet, they are still proceeding smoothly.

Risk evaluation requires a dynamic environment as the risk values concerning the defined threats are never fixed and always changing. Besides, during the process, it is always likely that certain new threats might appear which are also to be identified in due course. Consequently, risk evaluation studies are to be held and reviewed periodically in order to verify whether risk reduction measures already set are still effective or not. Such re-evaluations are to be conducted insistently and with short intervals. In the awareness of this requirement supported by the common sense from the meetings, UZMAR Pilotage Organization has decided to have such risk evaluation studies carried out once in every six months.

Considering the above facts and the constraints caused by meteorological conditions in the Nemrut Bay, UZMAR Pilotage Organization has decided to conduct the study called “Evaluating the Terms and Condition for Ship Maneuvering” for each individual pier. In this study, the variables which are relevant with the meteorological conditions have been examined (Table 3). Aim of this study is determining a standard basis for the prevention of uncertainties for decision making on ship maneuvering possibilities (always possible – conditionally possible – impossible) applicable by all pilots in the organizations considering the following variables

- wind direction (windward – leeward)
- wind force (Beaufort scale)
- operation types (berthing – unberthing)
- ship condition (loaded – ballasted)

Such issues as the right time to commence and/or cancel maneuvers under the above mentioned conditions as well as the conditions requiring any supplementary tugs were discussed and decided at a meeting where all pilots attended.

Table 3: Evaluating the Terms and Condition for Ship Maneuvering

<table>
<thead>
<tr>
<th>JETY</th>
<th>EGECELIK</th>
<th>BALLASTED CONDITION</th>
<th>LOADED CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BERTH NO</td>
<td>1</td>
<td>Berthing</td>
<td>Unberthing</td>
</tr>
<tr>
<td>Windward</td>
<td>Windward</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Leeward</td>
<td>Leeward</td>
<td>2.3</td>
<td>2.3</td>
</tr>
</tbody>
</table>

2.1. Shifting the ship alongside
2.2. Using the ship anchor
2.3. Recommending additional tug

6. CODE OF CONDUCT FOR HARBOUR PILOTS
In order to encourage internalization of the overall safety culture and make this internalization concrete in practice, a study on code of conduct was carried out. The detailed aims of this study could be highlighted as follows:

- Eliminating any vague and ambiguities in the behaviors of the staff.
- Taking proactive actions against any likely threats in the future.
- Preventing any likely behaviorist errors in the internal practices.
• Standardizing the forms of the staff behaviors.
• Protecting and supporting the internal safety policies in front of owners, agents and piers.
• Preventing interest conflicts
• Strengthening the image of the company in the public.

It should, in the meantime, be noted that while carrying out this study, “Code of conduct of Nautical Institute” and “Malta Maritime Pilotage Regulation” were made best of use of.

7. GATHERING AND ANALYZING STAFF EXPECTATIONS
The expectations of the employees from the company were gathered through interviews made with such three different groups as the pilots, the tug staff and the mooring and cabin staff. The expectations and proposals gathered could be highlighted as fallows:

• Overall expectations from the organization.
• Proposals for improving safe maneuvering.
• Proposals for safer working conditions.
• Proposals for measures to be taken to raise motivation.
• The points of education and training needed.

Taking into account all the expectation and proposals, a detailed report was submitted to the management. Following a thorough analysis, the planning for the future was shaped.

8. CONCLUSION
All organizations acting in maritime industry are supposed to take proper measures to sustain desirable safety in the services they offer. The safety measures in return are to meet the expectations from the parties rendered the services as well as from all the relevant social stakeholders. Besides, the threats against which such safety measures are taken ought to be determined accurately. Otherwise, it would be impossible to take measures against an almost infinite numbers of threats. The most possible accuracy in this matter would be meaningful and accessible through well-designed risk evaluations. Only then would it be affective to take measures against the threats over the risk values determined. Last but not the least point is that the safety measures decided should be reasonable, practicable and cost effective.

The required safety measures are determined, through any means of triggering “expectations”, in accordance with the risk evaluation results and with restrained budgets. The study carried out within such concerns enabled us to determine the threats and then specify the safety measures to be taken against the threats defined. In a sense, this study provided us with a map to be followed. Only after this specific step, was it realized that certain statistical data concerning the defined threats was a must. And it was then decided to update the “map” mentioned through the risk evaluations to be carried out periodically in compliance with the data gathered.

This study revealed that the safety raising measures alone would not be effective enough to eliminate the undesired consequences of hazards unless such measures are supported by certain other factors which could be highlighted as follows:

Sharing and Cooperation: Throughout this study, all the pilots employed at UZMAR had the opportunity to share their experiences. Likewise, the meeting held enabled the pilots and the tug staff to enhance their contacts and share their professional knowledge, skill, and experiences.

Application Principles: In compliance with the safety criteria determined, certain application principles were decided for the maneuvers challenging the risk limits, which decreased the stress suffered by pilots. Besides, a code of conduct was developed with the aim of enabling internalization of the safety culture as well as the organizational culture shaped in compliance with the safety criteria and the application principles for the pilotage services offered.

Motivation at Work Site: Considering expectations as well as the proposals of the staff for improving motivation at the work site, certain planning studies were carried out. In accordance with this plan, certain training programs were started for those who were thought to be promoted. Along with these programs, a series of certain other training activities was also commenced. In addition to such intensive planning, certain correcting and bettering studies were put into practice concerning the shift-related reorganizations, wages regulating plans and social right enhancement designs.
Further efforts are thought to be made particularly on “Harbour Pilot-Tug Boat Master Interface” and “Standard Communication Vocabulary, Phrases and Order Between Pilots and Tug Boat Crew”.

9. REFERENCES


