

## **Interim Results of a Longitudinal Study Into the Perceptions of Bridge Team Management (BTM) in Pilotage Waters as Experienced By Deck Officers Studying at the Australian Maritime College.**

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**Abstract** For the last three decades, Bridge Team Management (BTM) has been a process sitting at the periphery of a seafarers skill set, and had been seen as a “nice-to-have” skill, rather than a mandatory requirement. The situation has changed with the Introduction of the STCW2010 Manila amendments (2), which now requires that all bridge officers, during their studies for a Certificate of Competency, undertake Bridge Resource Management training. This project studies seafarer’s perceptions of BTM, how it has been implemented on board their vessels, and will look at how these perceptions change with the introduction of the Manila amendments.

This review of BTM is a longitudinal study based on a questionnaire given to students on the Chief Mate / Master’s course before Bridge Team Management as a concept is discussed in their course of study. The questionnaire uses a Likert scale to determine the subject’s attitudes to various aspects of the implementation of Bridge Teamwork in their experience at sea, and allows for additional comments to be added. This gave the subjects the opportunity to expand or further explain any of their answers, giving further insight into the application and understanding of BTM.

The results indicate that younger officers, working on deep sea vessels, where a harbour pilot is employed, are more used to the processes of BTM, and are more comfortable acting as part of a team than those of more advanced years working on smaller vessels generally without a pilot embarked. There are distinct differences in the perceptions of BTM between officers employed in the offshore industry, and those who work in the blue-water fleet. This marked difference between fleets is also seen in the equipment fit on the bridge, the requirements for pilots and how BTM is implemented.

The results are based on the first three years of the study, and represent a snapshot of perceptions before the introduction of STCW2010. The study will continue, for at least two more years, with the objective of assessing any change to the perceptions once Bridge Resource Management is embedded as a mandatory requirement.

*Keywords: Bridge Team Management, STCW2010.*

## 1.Method

The questionnaire was designed to pose a series of questions which gave the subject the opportunity to indicate their experience of accidents and incidents in port operations, as well as indicating their perception of situational awareness, management styles, cultural issues, crisis management, and also looked at the possible effects of increasing complexity of bridge equipment

The Likert scale (1) chosen gave five possibilities, namely “Always”, “Often”, “Sometimes”, “Hardly ever”, and “Never” or “Strongly agree”, “Agree”, “Neutral”, “Disagree”, and “Strongly disagree”. Where thought necessary, space was provided in the questionnaire for the subjects to add additional description, in order to establish the nature of any incident that had occurred in pilotage waters. A final section was provided for the subjects to add any further comments.

Questionnaires were distributed to members of a class studying the Navigation Management unit, part of the Chief Mate/Master course. As part of this unit, the students will discuss the implementation and application of Bridge Team Management systems aboard vessels. Since the chief investigator for the research project was also the lecturer for the unit, another member of staff was used to distribute the questionnaire, in order to remove any bias on the part of the students attempting to answer as might be perceived to be required, or that might be a result of unintended pressure to give the “right” answer. The distribution of questionnaires was also timed to occur before the subject of Bridge Team Management was discussed in class, thus ensuring, as far as possible, that the results were based on what the students had experienced at sea, rather than learned in class.

The students on the Chief Mate/Master course were chosen as the target group for a number of reasons. Firstly, the class consists of students who have entered by a number of different routes, be that limited tonnage, limited area, a traditional unlimited route, and more modern “fast track” cadet training. Thus, the student group collectively had a wide variety of experience not only in different ship types and sizes, but also in their sea-going experience. Secondly, at the time of starting the research, the requirement for Bridge Team Management training was not compulsory. Although seen as best practice, Bridge Team Management was introduced only in this course, as a tool for use by senior officers. The principles of Bridge Team Management (BTM) were discussed with reference to the student’s own experience. Some of the students would have been exposed to the principles, and implementation of the principles was part of the research. Thirdly, implementation of Bridge Team Management principles was not universally applied, and the experience of watch-keeping officers both with and without the implementation was worthy of note.

Classes of students study in four teaching blocks in a year. The course itself extends over three blocks, A, B and C, and with the unit delivered in block B, there would be either one or two deliveries in a calendar year. Classes varied in size from the low 20’s to over 50 students, giving an irregular number of returns from each student cohort. This gives an uneven distribution of subjects against time. The possibility of measuring a specific rate of change in perception with time has been disregarded as unworkable due to this unevenness. However, since this paper looks at the interim results of the study, it is possible to establish the pre Manila amendment perceptions. Each possible answer in the Likert scale used in the questionnaire has been numbered 1 to 5, and the average and standard deviation for each question established. This establishes the level of perception as a quantitative value for the subjects so far.

The study will continue, with the expectation that subsequent student groups will have been exposed to BTM during their earlier studies, and these new subjects' perceptions of BTM will be assessed to note changes.

## 2. Results

The interim results review the responses from three cohorts of students, who all attended the college in 2011 and 2012. Not all students chose to complete the questionnaire, a choice required by the ethics approval for this research project. The result was a total of 66 voluntary returns. Although this is a fairly low number, it does represent a cross section of the shipping industry, including as it does Australian seafarers employed on the Australian coast and internationally, as well as overseas students employed in a variety of trading patterns. (See Table 1)

<b>Last Vessel</b>	Offshore 19	Bluewater 44	Undeclared 3			Total 66
<b>Nature of trade</b>	Foreign 38	Interstate 24	Undeclared 4			Total 66
<b>Last rank served</b>	Cadet 13	3rd Mate 11	2nd Mate 35	Chief Mate 4	Master 1	Total 66
<b>Years' experience</b>	0 – 5 52	5 – 10 6	10 – 15 4	15 + 4		Total 66
<b>Age</b>	<20 1	20 – 30 31	30 – 40 23	40 – 50 10	50 + 1	Total 66

Table 1 – subjects taking part in the project

From Table 1 it can be seen that the subjects are biased towards younger, less experienced subjects who have generally served in junior officer capacity at sea. This is unsurprising given that the subjects are drawn from student groups studying for their chief mate certificate of competency. They will therefore have some experience as Watchkeeping officer: the outlying individual is a subject who had sailed as master with a restricted tonnage certificate of competency, and was studying to remove the restrictions on his certificate. Likewise, the 4 subjects who had sailed as chief mate were also studying to remove the tonnage restrictions on their certificates of competency. This does then mean that the results are biased towards the experience and perceptions of junior officers. However, the experiences on which the questionnaire is based refer to BTM evolutions which will have included other officers of differing ages and experiences. So, although we are reviewing the experiences of junior officers, the experiences will be determined by leaders with more experience, who are less likely to have been exposed to the tenets of BTM.

Since all these students have attended college before the mandatory introduction of training in Bridge Team Management as required by the 2010 amendments (Manilla Amendments) to the Seafarers' Training, Certification and Watchkeeping (STCW) Code, they will form the basis on which will be determined any changes to perception of BTM. Students attending the Chief Mate/Master course after this date will probably have studied BTM as part of their Officer of the Watch qualification, though this will only be true for students who return to their studies after gaining the minimum required sea service or who are part of the "fast track" programme<sup>1</sup>. Students who have been at sea for a considerable period of time without advancing their qualifications will still form part of future groups, and this may have to be considered in later results.

<sup>1</sup> The "fast-track" training scheme, is designed for students to complete all the academic part of their training up to Chief Mate/Master, before taking their oral examination as Officer of the Watch. This is the reason why there are a number of subjects whose last job was Cadet in Table 1

The following table (Table 2) lists the xx questions asked of all subjects.

No	Subject area	Question
1	Situation Awareness	During pilotage on your last vessel how often did you feel that your bridge team was unable to integrate all the information that made up the operational environment (ie. objects, events, people, systems and environmental factors) so as to perceive what was happening?
2	Situation Awareness	During pilotage on your last vessel, do you believe that your bridge team was able to sufficiently comprehend what was occurring in the operational environment so as to recognise its impact on the goals and objectives of the team?
3	Situation Awareness	On your last vessel how often did you feel that your bridge team had the ability to project their perception and comprehension of the operational environment forward in time so as to determine what might happen next?
4	Attitudes and Management skills	During pilotage in the past two years, how often have you felt like volunteering your assistance when it appeared that the pilot had not been using all of the available human resources on the bridge?
5	Cultural awareness	During pilotage in the last two years how often did you feel that the pilot/captain's actions made the bridge team feel as though their presence or contributions were not considered equal in the safety of the vessel?
6	Communication and briefing	On average, how well do you think your bridge team is integrated into the pilot's passage plan and briefings, prior to entering a port?
7	Challenge and response	On your last vessel, how often did bridge team members speak up and challenge situations when they believed the limits of safety had been exceeded during pilotage?
8	Short term strategy	On your last vessel how confident were you that if a problem arose that had not been addressed in the passage plan, your bridge team would be able to identify the problem, build a plan, check the plan, perform a briefing and monitor the situation?
9	Authority and assertiveness	During pilotage on your last vessel, how often was your master able to coordinate the bridge's activity so as to bring about an appropriate balance between the pilot's authority and the bridge team's assertiveness?
10	Management Styles	Depending on the situation, do you find that your captain uses a balance of performance and people orientated management styles to get the best out of the bridge team?
11	Workload	During pilotage on your last vessel, how often was delegation used effectively to correct the high workloads of bridge team members that deviate towards doing everything themselves?
12	State of ship (NOTE)	On average in your current role as a watchkeeper, which of these terms best describes the general state of the bridge team during pilotage?
13	Human involvement in error	Human errors should not be expected during pilotage operations and culprits must be singled out and blamed for their actions?

14	Judgement and decision making	Hidden factors such as personality conflicts, time constraints, uncertainty, stress and lack of knowledge plays a large part in weakening the strength of my bridge team.
15	Leadership in emergencies	Do you feel confident that in an emergency situation such as a steering failure during pilotage, your bridge team would be able to manage the situation to the best of their abilities through the techniques of leadership and delegation?
16	Crisis and crowd management	In a crisis scenario during pilotage, do you believe that your bridge team would be able to manage the vessel if the pilot/captain became incapacitated
17	Automation awareness	A bridge that is highly automated with technologies such as ECDIS (Electronic Chart Display and Information Systems) decreases workloads, reduces errors and optimises situational awareness.

Table 2 – Questionnaire questions

With the exception of question 12, the 5 part Likert scale allowed for a number between 1 and 5 to be assigned to the answer, and the average answer for sample to be determined for each question. The numbering conformed to a value using 1 as the positive, agreement, most likely end of the scale, 3 as the neutral value and 5 as the negative, disagreeable, least favourable option. The questionnaire answers having been assessed in this fashion the average for the sample was determined, and the standard deviation calculated to give a measure of whether the average was significant or not. These results are given in Table 3.

Question	Area	Average	Standard Deviation
1	Situation Awareness	3.648	1.148
2	Situation Awareness	1.677	0.670
3	Situation Awareness	1.888	0.754
4	Attitudes and Management skills	3.000	1.123
5	Cultural awareness	3.785	1.091
6	Communication and briefing	2.246	0.961
7	Challenge and response	2.461	1.144
8	Short term strategy	1.953	0.734
9	Authority and assertiveness	2.063	0.936
10	Management Styles	2.281	0.928
11	Workload	2.219	0.950
13	Human involvement in error	2.246	0.898

14	Judgement and decision making	2.270	1.199
15	Leadership in emergencies	1.923	0.775
16	Crisis and crowd management	1.938	0.920
17	Automation awareness	2.661	1.177

Table 3 Average responses and Standard Deviation for questions

Question 12 allowed the options “Inattentive”, “Bored”, “Optimum”, “Concerned”, and “Alarmed”. It was not considered in the same way as the other questions since the scale was not the same. However over half (35 from 66 returned questionnaires) described the general state of the bridge team as Optimum, while a sixth (11 from 66) described the team as bored. Of more concern, were the four subjects who described their bridge team as inattentive, the 9 who described their team as concerned, and, perhaps of most concern, the 4 who described their team as alarmed.

## Conclusions

The volunteers who undertook to complete the questionnaire, do not represent a fair cross section of the man-power employed as bridge Watchkeeping officers at sea. Junior officers with short experience as watchkeepers are over-represented, and there are very few returns from senior more experience personnel. Although this does give a biased result, the study is a longitudinal one, observing, in part, the effect of the introduction of the mandatory training. Therefore the effectiveness of the training can be assessed by looking at the perceptions of similar groups observed before and after the introduction of the training. It is the change that is being measured, not the specifics of the sample groups, provided the sample groups are similar before and after. By choosing the student groups that we have, it is likely that similar age, experience and job title profiles will be experienced in future groups.

These interim results of this longitudinal study have established the perceptions of Bridge Team Management for subjects who have not been required to study Bridge Resource Management as a mandatory part of their qualifications. This questionnaire results from this pre-Manilla amendment group, will provide the basis for comparison to the results from future cohorts of students. It is hypothesised that the future groups will perceive that the bridge teams in which they work will implement bridge team management in a more effective fashion, supporting the IMO in its mission to promote safe, secure, environmentally sound, efficient and sustainable shipping through cooperation.

## **References**

1 –Likert R, “A Technique for the Measurement of Attitudes,” Archives of Psychology, 1932, Vol. 140, No. 55.

2 – “The Manilla Amendments to the Seafarers’ Training, Certification and Watchkeeping (STCW) Code” – International Maritime Organisation.