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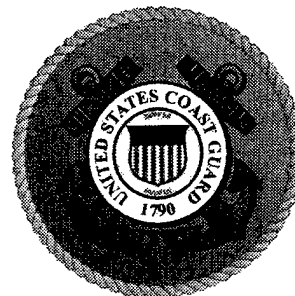
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CONDUCTING MARINER ASSESSMENTS



FINAL REPORT
May 2001



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16. Abstract (MAXIMUM 200 WORDS) This report describes the final phase of a research project that examined some key technical requirements of the International Maritime Organization's (IMO) <i>Seafarer's Training, Certification and Watchkeeping Code (STCW Code)</i> , as amended in 1995. During this final phase, the issues associated with the <i>conducting</i> of valid and reliable assessments were examined on simulators, on training ships, and, in particular, on commercial vessels. Assessment procedures were adaptable to the circumstances of each of these settings. On commercial ships, regular officers with little training in the process and with little time to devote to preparation, conducted successful assessments using self-contained and ship-specific procedures. Thorough prior preparations of the assessment "package" to be handed over to them were found to be a necessary prerequisite. The different assessment settings (e.g., simulators, training ships, or commercial vessels) offer different strengths for assessing proficiencies, and are discussed in the report.					
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This report documents some of the recent work of an ongoing project that has been conducted by the United States Coast Guard (USCG) Research and Development Center (R&DC) for the USCG National Maritime Center (NMC) over the past several years. The authors of this report have had the opportunity and pleasure to gain an understanding of the theoretical and practical issues involved in mariner assessment while working with many knowledgeable experts. We would especially like to thank our sponsors at NMC, representatives from USCG Headquarters and Maritime Administration (MARAD), academy representatives, industry representatives, participating mariners, and colleagues who have supported this effort.

Mr. Perry Stutman of NMC has provided continual support and guidance in the conduct of this project. We have also received support and guidance during the course of this work from others at NMC, including Captains Myles Boothe and William Bennett, Mr. Donald Kerlin, Mr. John Bobb, Mr. David Fields, and Mr. Albert Kirchner. CDR Steven Boyle and Mr. Christopher Young of USCG Headquarters and Mr. Christopher Krusa of MARAD have provided critical comments, suggestions, and support at several points during this project.

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Finally, we thank the many mariners who participated in the assessment trials. Without them, we would not have been able to evaluate the assessment method and procedures. We thank the faculty and cadets from Massachusetts Maritime Academy and California Maritime Academy who participated in or assisted with preliminary trials of assessment procedures. And we are extremely grateful to SeaRiver Maritime, Inc. (SRM) personnel who assisted us in coordinating trial assessments on their ships and especially to the many SRM crewmembers who participated in trial assessments. These crewmembers voluntarily participated in trial assessments despite their already busy schedules and offered us a tremendous amount of invaluable feedback. Again, we are very grateful to them.

EXECUTIVE SUMMARY

Introduction to the research and development project

The International Maritime Organization (IMO) in its 1995 amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW Convention) and the accompanying Seafarer's Training, Certification and Watchkeeping Code (STCW Code) mandate the assessment of mariner proficiencies by practical demonstration. This requirement is a substantial departure from earlier practice, and methods for developing, conducting, and documenting such assessments must be established. The National Maritime Center (NMC) of the U.S. Coast Guard (USCG) sponsored a research project through the USCG Research and Development Center (R&DC) to examine the implications of the mandate and to ensure that the best practices are available to the industry. The overall objective of the project was to provide a systematic, step-by-step process for developing and conducting valid and reliable assessments and to investigate its feasibility for implementation.

Project efforts reported here

The present report describes the fourth and final phase of the project. In this phase, we examined the process of *conducting* assessments on simulators, training ships, and, in particular, commercial vessels. For a preliminary examination of the process, the two maritime academies that had been involved with us in the earlier phase of developing assessments conducted preliminary assessments on their simulators and training vessels. Massachusetts Maritime Academy (MMA) conducted assessments of selected bridge proficiencies; California Maritime Academy (CMA) conducted assessments of selected engineering proficiencies.

The major emphasis of the present report is on more formal trials of proficiency assessments carried out with SeaRiver Maritime, Inc. (SRM) onboard four of their tankers. We assisted them in adapting and preparing existing procedures, training their ship's officers in assessment, conducting the trial assessments, and considering requirements for integrating assessments into ship's operations. We found that these aspects of assessment are quite interdependent, with tradeoffs in resource requirements among them. The assessment procedures were adapted to the equipment and operations of each ship, and highly detailed assessment worksheets were prepared, with built-in instructions to guide the assessor. With this careful tailoring of the assessment procedures, regular ship's officers were able to conduct the assessments with a minimum of training. When the procedures were sufficiently refined, ship's officers were able to perform the assessments even while standing a watch. Based on their experience in these trials, participants concluded that shipboard assessment was feasible, provided that assessments were carefully integrated with company standing orders, ship's operations, company training, records, and certificates of discharge. Companies need to be responsible for minimizing the burden on the ship's officers. An updated version of a brief and concise assessor's manual, developed and provided to support the assessor, is included in the report, along with the sample assessments that were adapted or developed by SRM officers.

Based on the project's overall findings, some general principles for conducting successful assessments are also briefly discussed in this report. First, thorough preparation is a necessary

prerequisite for assessment. Carefully prepared assessment objectives provide a powerful tool for further planning. The assessment setting should be selected based on its suitability for the assessment of a particular proficiency. Any setting must be evaluated for its capability to support a planned assessment. While it seems more obvious that simulators need to be evaluated, even training or commercial vessels may not provide all of the operational conditions required for assessment of a particular proficiency. Each setting has strengths for the assessment of certain types of proficiencies. Finally, it may be necessary to combine assessments over sessions, transits, or even settings. A single session, transit, or setting may not provide the time or the conditions to complete an assessment, and a mechanism is needed to record and combine partial assessments for an individual.

Recommendations

The NMC-sponsored R&DC project produced a range of findings and products to support structured STCW-compliant assessments based on practical demonstration. The following recommendations apply to the contents of this report and to those of reports from earlier phases of the project. The following actions will result in the most effective implementation by the USCG and the maritime industry.

- The USCG should encourage the maritime industry in the use of the project's findings and products. As a first step, the materials should be made widely available, on the USCG STCW website (<http://www.uscg.mil/stcw>) and through the National Technical Information Service (NTIS). Potentially, the materials could serve as the basis of a Navigation and Vessel Inspection Circular (NVIC). The USCG should submit the component materials to the IMO subcommittee on Standards for Training and Watchkeeping.
- The USCG should encourage further familiarity with the structured approach by USCG staff, as a tool for discussions of assessment with the industry and for the review of procedures submitted for approval.
- The USCG should encourage the review and use of the method and materials by those groups that are dealing with the important technical issues of assessment. These include the Maritime Academy Simulator Committee (MASC), the Merchant Marine Personnel Advisory Committee (MERPAC), and academy committees appointed by the Maritime Administration (MARAD) to address STCW issues. The materials can provide a common approach and a common basis for discussion.
- Those in the industry who are responsible for training and assessment of mariner proficiency in academies, training schools, and shipping companies should make use of the method and the materials presented here as a guide for their own development of assessment procedures. The project materials are especially appropriate for inclusion in train-the-trainer and train-the-assessor courses. Shipboard assessors will find the *Assessor's Manual* (Chapter 2) appropriate for their needs.

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CONDUCTING MARINER ASSESSMENTS

Chapter 1

OVERVIEW

This chapter describes an exploration of the practical issues associated with *conducting* assessments of mariner proficiencies. First, Massachusetts and California Maritime Academies tested assessment procedures, which they had prepared earlier, conducting a limited number of cadet assessments on their simulators and on their training vessels. After these preliminary trials, we worked with SeaRiver Maritime Inc. to examine mariner assessment in the demanding setting of commercial ship operations. Our description of shipboard assessment is organized around four broad issues:

- Adaptation of preparation of assessment procedures to take them from setting to setting, ship to ship.
- Training and preparation needed by assessor, especially by the regular shipboard officer.
- Practical considerations of conducting over-the-shoulder assessments during commercial operations.
- Integration of assessments into shipboard procedures and operations.

The chapter concludes with an overview of what we learned about mariner assessment over the several phases of the study, and with recommendations that the USCG disseminate the project findings and encourage their use.

This report may be downloaded from the U.S. Coast Guard Research and Development Center web site at <http://www.rdc.uscg.mil>.

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INTRODUCTION

Background and Overview of the Research Project

The International Maritime Organization (IMO) in its amendments to the Seafarers' Training, Certification and Watchkeeping (STCW) Code (IMO, 1996A, B) mandates the assessment of mariner proficiency by demonstration of skills for numerous areas of competence. In response to this requirement, the United States Coast Guard (USCG) has provided guidance in the assessment of mariner skills and knowledge that calls for a *practical demonstration* of mariner proficiency (46 CFR 10.103, 46 CFR 12.01-6, USCG (1997A, B, C)). "Practical demonstration" refers to a mariner's performance of an activity that is determined by an assessor to meet a specified standard of proficiency in a setting that closely approximates the work environment.

The requirement for a practical demonstration of proficiency is a substantial departure from earlier assessment practice in the maritime community. Accordingly, methods for developing, conducting, and documenting assessments that meet this new requirement must be established. The USCG National Maritime Center (NMC) sponsored this research project through the USCG Research and Development Center (R&DC) to examine the implications of these requirements, and to ensure that the best practices of assessment technology are available to the maritime industry. We organized this project around several key issues: the nature of a valid and reliable assessment, the simulator capabilities needed to support assessment, the types of supporting materials that industry instructors/assessors would need to develop such assessments, and the special requirements of shipboard assessment. Our examinations of the first three issues are described in other documents. This report focuses on our examination of shipboard assessments. A brief overview of the entire project was published as Smith and McCallum (2000).

Earlier Phases of the Research Project

Our first objective was to develop an approach to assessment that would be both technically rigorous and practically feasible for the maritime industry. We reviewed the requirements of STCW, the methods of Instructional Systems Development (ISD), and the best practices of the maritime industry. From these sources, we distilled what was needed to develop valid and reliable assessments – that is, assessments that measure the critical skills and knowledge needed to perform the duties of interest (validity), and do so consistently over multiple applications of the procedure (reliability). The key to valid and reliable assessments is prior preparation of the assessment, with participation and review by appropriate subject matter experts. To aid the developer in the preparation, we described a systematic step-by-step method to: 1) *Specify assessment objectives*, 2) *Determine assessment methods*, 3) *Specify assessment conditions*, 4) *Develop proficiency criteria*, and 5) *Prepare the assessment materials*. To refine the method and to ensure that it was feasible for the maritime industry, we worked with the U.S. Merchant Marine Academy (USMMA) on a case study, developing an assessment of mariner performance of Automatic Radar Plotting Aid (ARPA) operation. The general method and the ARPA case study are described in a project report (McCallum, Forsythe, Smith, Nunnenkamp, & Sandberg, 2000).

Following this initial case study, we developed a method to evaluate simulators in their capability to support assessment by allowing the mariner to realistically demonstrate the performance to be assessed, and by allowing the instructor/assessor to prepare, control, monitor, and record assessment exercises. We refined the method with a second case study examining the capability of desktop simulators to support the ARPA assessment that had originally been developed for the high fidelity simulators at the USMMA. Our method is described in a second project report (Raby, Forsythe, McCallum, & Smith, 2000A). The report includes the method for evaluation, suggestions for analyses of the results of an evaluation, and, as an example, our protocol for evaluating ARPA simulators. The approach is also described, briefly, in two conference papers (Raby, Forsythe, McCallum, & Smith, 2000B, and McCallum & Smith, 2000). The method is intended to be general and applicable to simulations of other types of equipment and environments, even in other industries. As an example, the general approach has been used to examine engine room simulators (Stutman, 1999).

The project efforts described above required the participation of consulting human performance experts as well as maritime instructors. Our third objective was to ensure that our method for developing assessments could be applied by maritime instructors/assessors without the help of such consultants. In the spring of 1998, we prepared a workshop and invited a representative sample of instructors to attend and comment on the method and materials. We then invited a number of the attendees to apply the method and to work with us in developing a manual to assist them in their applications. Faculty from Massachusetts Maritime Academy (MMA) developed assessments for selected bridge proficiencies; California Maritime Academy (CMA) developed assessments for selected engine room proficiencies. The workshop materials, a manual on developing assessments, and the sample assessments developed by the academies are provided in a third project report (McCallum, Forsythe, Barnes, Smith, Macaulay, Sandberg, Murphy, & Jackson, 2000). While we refined the method with the help of maritime academies, the method is meant to be generally useable and workshop attendees from a variety of institutions have reported making use of the approach and the materials.

The Present Phase of the Research Project

One of the lessons we learned in earlier phases of the project was that *developing* and *conducting* assessments involve very different sets of issues. In the earlier phases, we had emphasized development. For the present phase of the project, we examined issues associated with conducting assessments, organized around the following broad topics:

- Adapting and preparing assessments for use in different settings.
- Training and preparation of assessors.
- The process of conducting assessments.
- Integrating assessments into operations.

For this phase of the research project, Massachusetts and California Maritime Academies conducted preliminary trials of the assessment procedures on their simulators and training vessels. Following these applications, we worked with SeaRiver Maritime Incorporated (SRM) to examine the demanding situation of assessment onboard commercial ships, revising and adapting the procedures developed by the academies. Assessment onboard the SRM ships was

the primary focus of this effort. Note that we were able to examine only a limited number of settings and proficiencies; other important settings and proficiencies within the industry were neglected in order to keep the project scope manageable. Table 1-1 summarizes the settings and proficiencies sampled during our work in assessment development and trial implementation.

Table 1-1. Summary of assessment settings and mariner proficiencies sampled.

Mariner Proficiencies	Assessment settings		
	Full-Mission Simulators	Training Vessels	Commercial Ships
Lookout	MMA, preliminary trials	MMA "Ranger," preliminary trials	SRM, formal trials
Helmsman	MMA, preliminary trials	MMA "Ranger," preliminary trials	SRM, formal trials
Locate Generator Faults	CMA, preliminary trials	Not tried	Not included
Prepare Main Engine	Not tried	CMA "Golden Bear," preliminary trials	SRM, formal trials
Test Steering Gear	Not included	Not included	SRM, formal trials

These efforts and the resulting findings are described in the present report. The materials developed, tested, and refined during this phase of the project include a manual on conducting assessments (Chapter 2) and several sample assessment procedures (Appendixes A-D). The project approach for developing assessments (McCallum, Forsythe, Barnes, Smith, Macaulay, Sandberg, Murphy, & Jackson, 2000) and that for conducting assessments discussed in the present report, taken together, are fully compliant with the IMO Circular titled "Guidance on shipboard assessments of proficiency" (IMO, 1998), which broadly covers both functions.

PRELIMINARY TRIAL ASSESSMENTS WITH ACADEMIES

Faculty at MMA and CMA worked with us in developing the Lookout, Helmsman, Locate Generator Faults, and Prepare Main Engine assessment procedures. As part of that development process, preliminary trial assessments of each procedure were conducted in a range of settings, as summarized in Table 1-1. The primary purpose of conducting these trials was to identify aspects of the assessment development method that required further refinement. The secondary objective was to gain an initial understanding of the issues involved in conducting assessments. Final versions of the assessments used in these preliminary trial assessments can be found in the earlier project report on developing assessments (McCallum, Forsythe, Barnes, Smith, Macaulay, Sandberg, Murphy, & Jackson, 2000).

Bridge Proficiency Preliminary Trials

Preliminary trials with the Lookout and Helmsman assessment procedures were conducted at MMA, using both the academy's ship bridge simulator and the training vessel *Ranger*. The assessment settings, conditions, and findings pertinent to conducting these preliminary trial assessments are discussed below.

Ship bridge simulator description, conditions, and findings

A general requirement for valid assessments is that the assessment setting provide an adequate representation of the work setting to allow presentation of the conditions prescribed in the assessment procedure. Presenting these conditions allows, in turn, the realistic performance of the necessary actions by the candidate and the observation and application of standards by the assessor. Specific requirements with respect to the validity of the Lookout assessment are accurate representation of visual and auditory field of view, representation of environmental conditions (especially various restricted visibility conditions), and visual and auditory target detail and realism. Specific requirements with respect to the validity of the Helmsman assessment are accurate environmental effects and ship hydrodynamics to allow assessment of maintaining the ordered course under various sea conditions.

The MMA ship bridge simulator can accurately simulate a range of deep draft vessels and a tug and barge combination in nine different geographic areas or open ocean. This simulator includes a full suite of bridge equipment. Two preliminary assessment trials were conducted with early versions of the Lookout and Helmsman assessment procedures using MMA's ship bridge simulator. Each trial was conducted for less than one hour. Open ocean scenarios and tanker vessel models were used for these trials. The MMA faculty member who had led the development of the Lookout and Helmsman assessment procedures assessed two volunteer cadets. Senior members of the research team observed these trials, along with other selected academy staff.

During these trials, researchers observed that both visual targets and environmental conditions could be programmed as needed to meet the requirements of the Lookout assessment procedure. Specifically, numerous and varied visual targets could be programmed in both daylight, night time, and restricted visibility conditions. It was also observed that both waterways and traffic could be programmed to meet the basic requirements of the Helmsman assessment procedure,

providing conditions that required frequent course changes in response to helm commands. In discussions with academy staff following the assessments, it was agreed that the bridge simulator appeared to provide a good basis for the initial assessment of lookout and helmsman basic skills and knowledge.

Training vessel description, conditions, and findings

The training vessel *Ranger* is an 85-foot twin screw vessel built in 1982 as an oil field recovery craft. The gross tonnage is 87 and the net tonnage is 59. The vessel is presently fitted for small vessel operations, but has electronic navigation equipment comparable to that typically found on larger deep draft vessels. The vessel has bridge wings that provide a good setting for training and assessing Lookout procedures. The *Ranger's* helm is representative of a commercial vessel in this size range, providing an excellent platform for assessing shiphandling skills associated with such vessels. Obviously, the *Ranger* does not handle the same as does a large deep draft vessel.

Trial assessments were conducted using the Lookout and Helmsman procedures used earlier in the simulator trials. Four separate trial assessments were conducted with each of the two assessment procedures during a four hour person-overboard training period in Buzzards Bay near MMA. Each trial assessment lasted between 40 and 60 minutes. Assessments were relatively structured, following the organization and content of the assessment procedures. Assessments relied upon a significant number of questions from the assessor. In addition, some degree of realism was sacrificed for the sake of efficiency. Specifically, fixed objects on land were designated as targets for the lookout to report and the helmsman was given very frequent helm commands. The trial assessments were conducted by a licensed master and a senior academy cadet, and observed by a senior member of the research team. Following the assessment period, the researcher informally debriefed assessors and candidates.

The trial applications aboard the *Ranger* were useful in identifying some of the ways in which such a vessel could be used to meet the requirements of selected assessment procedures. Over a short period of time, the candidates' ability to orient themselves aboard a vessel and provide useful and accurate reports in accordance with standards for reporting could be determined. The helm station aboard the *Ranger* was found to be adequate for assessing basic operation of a helm under operational conditions. The brief period of time employed during the trials did not allow assessment under the full range of environmental conditions, nor did it allow for assessment of job performance throughout the period of a typical lookout or helmsman watch.

The debriefings with the assessors and candidates yielded a number of noteworthy findings. First, candidates had a wide range of reactions to the assessment. Specifically, a limited number of candidates reported being intimidated by the process. It should be noted that cadets were assessed with limited warning or specific preparation, which would not be the case under normal applications of the procedures. Some cadets who were not intimidated by the assessment process remarked that they considered it to be a good means of identifying their own particular strengths and weaknesses in lookout and helmsman skills and knowledge. Assessors recognized that only a small portion of the assessment could be applied during the limited time, but felt they were able to obtain a good assessment of the lookout and helmsman basic knowledge and application of lookout and helmsman procedures in an operational setting.

Engine Room Proficiency Preliminary Trials

Preliminary trials with the Locate Generator Faults and Prepare Main Engine assessment procedures were conducted by CMA, using the academy's diesel engine simulator and training ship *Golden Bear* as settings. The assessment settings, conditions, and findings pertinent to conducting these assessments are discussed below.

Diesel simulator description, conditions, and findings

The CMA diesel simulator consists of a series of control consoles that represent all of the various systems comprising a generic slow-speed diesel tanker of approximately 20,000 shaft horsepower. This simulator does not have a mock-up engine room, limiting its training and assessment applications to engine control room activities. The diesel simulator provides students direct access to all systems, at all levels of vessel operation. Scenarios can begin with a "cold" ship (no fuel, water, air, etc. onboard) and proceeds up through full-away sea speed. Training typically includes a wide variety of casualty response drills incorporating any number of ship systems.

A single trial application of the Locate Generator Faults assessment was conducted on the CMA diesel simulator. The faculty member who conducted the assessment had not participated in the development of the assessment and had limited familiarity with the assessment objectives and procedure. A group of four cadets was presented with some of the conditions prescribed in this assessment over a two-hour period. Two senior researchers observed the assessment trial application, but did not conduct debriefings with either the assessor or candidates following the assessment period.

The trial assessment with the Locate Generator Faults procedure provided the research team with an opportunity to gain a preliminary understanding of some of the requirements associated with conducting engineering assessments that are not based upon a series of well-defined steps for their performance. Such tasks can be characterized as those that apply knowledge in a variety of conditions that cannot be easily predicted by the mariner. When the assessment of knowledge is coupled with operation of a highly complex and variable system, issues concerning assessor control of the assessment conditions become critical. During the trial application of the Locate Generator Faults assessment, multiple difficulties were encountered in initially bringing the generator online. Due to a combination of earlier faults introduced by the assessor and actions taken by the candidates, the intended generator fault was never introduced during the two-hour assessment period.

The basic lesson learned during this trial application was that extensive control of initial conditions is required when assessment involves the operation of complex equipment that can vary widely in its operating status. A similar situation was encountered in earlier project work during the development of the ARPA assessment. In that case, well-prescribed scenarios of limited duration were developed to provide a means of establishing and maintaining consistent assessment conditions, thereby enhancing the level of assessment reliability.

Training vessel description, conditions, and findings

The training vessel *Golden Bear* is a 400-foot, 10,000 ton vessel powered by twin Enterprise R5-V16 medium-speed diesel engines that generate 17,000 horsepower at 120 RPM. At sea, a

3900 kW generator supplies all electrical needs. A typical cruise has 190 cadets onboard for two months.

CMA faculty reviewed and refined the Prepare Main Engine assessment until it was a complete and well-defined procedure, then conducted trial applications during the 1999 summer training cruise aboard the *Golden Bear*. Twenty-six cadets, who were making their third cruise, took part in the trial assessments using the refined version of the Prepare Main Engine assessment procedure. Typically, two cadets were assessed by two faculty members concurrently, with separate cadets responsible for preparing each of the two main engines for operation. The cadets being assessed worked on their own without receiving help from any other cadets during the assessment period. The assessments of the 26 cadets with this procedure were conducted as part of 13 starts of each main engine over the 30-day training cruise. This was accomplished during both scheduled departures and mid-transit engine shut downs and re-starts. It should be noted, however, that all checks involved in this assessment can be made by turning the engine over a limited number of times without actually starting the engine. Members of the research team were not able to observe the assessments and our findings are based on reports from CMA faculty.

Although the *Golden Bear* has many more cadets onboard than crewmembers on a typical commercial ship, candidates worked independently when being assessed. In contrast to the Locate Generator Faults assessment, the Prepare Main Engine assessment involves a series of well-defined steps and standards of performance, typically performed under well-defined conditions. The main engine is shutdown and the objective of the mariner's task is to determine whether all subsystems are within operating standards. One would expect that such an assessment procedure would work well in the shipboard environment, which was the case. Assessors were able to predict the time required for an assessment and schedule them into the ship's training schedule. The CMA assessor reported that once preparatory work had been completed to ensure consistency between the assessment procedure and ship's procedures, assessments were conducted under similar operational conditions in a consistent manner in all cases. This latter finding suggests good levels of validity and reliability were achieved in the trial application of this procedure.

TRIAL ASSESSMENTS ON COMMERCIAL VESSELS

USCG R&DC established a cooperative agreement with SeaRiver Maritime Inc., basing the agreement on the Oil Pollution Act of 1990. This Act provides for partnerships between Government and industry for research into new technologies, including operational practices. SRM invested an impressive amount of time and expertise in the project, and we are grateful to them for their contribution. Members of the company helped to coordinate several visits to ships, assisted in introducing the research project and goals to ship crewmembers, revised and adapted assessment procedures, and conducted and participated in trial assessments. Note that this research was conducted on very busy ships during their normal operations; crews voluntarily participated in the project, devoting the time they could, depending on work schedules and the perceived priority of the project, which varied among ships.

A total of four SRM ships participated in the research project, three on the West Coast and one on the East Coast, during the period from October to December 1999. Diesel-powered ships were selected because one of the engine room assessments (Prepare Main Engine) was geared toward diesel engines. Three of these four ships had very similar main engines and engine room configurations, while the fourth, though diesel-powered, was quite different. Two similar types of steering gear were used aboard these ships. Ships were selected based on scheduling and willingness to participate in the research.

The following sections address the technical approach and findings from the trial assessments, organized around four topics: adapting and preparing assessment procedures, training and preparation of assessors, the process of conducting assessments, and integrating assessments into operations.

Adapting and Preparing Procedures for Use in Onboard Assessments

Matching procedures to operational job requirements

Members of SRM participating in the trial assessments initially reviewed the assessment procedures developed by the academies. The two bridge procedures – Helmsman and Lookout – were determined to contain most key job requirements of these positions. Minor changes were made to the text to increase clarity and to the formatting to make the forms easier to use. These initial procedures were used for approximately the first half of the bridge assessments, with assessors taking notes as to problem areas. Both bridge procedures were then extensively revised for the assessments on the remaining two ships. Specifically, the performance measures, performance standards, and proficiency criteria were extensively revised to increase the level of objectivity and detail. The worksheets and checklists were changed to allow for alternatives such as “not appropriate” and “not observed.” This was particularly important for the bridge assessments, which specified a variety of assessment conditions that may or may not occur during the assessment process. In addition, some items were found to be inappropriate for operations onboard SRM ships, and these items were deleted or changed.

The two engine room procedures – Prepare Main Engine and Locate Generator Faults – did not match operational requirements for SRM vessels. The steps involved in the Prepare Main Engine assessment were not accurate for the engines onboard the SRM ships. A senior engineer

used the Prepare Main Engine format and made extensive changes to the procedure in order to reflect the steps involved in starting the main engines on these ships, and the corresponding measures and standards. He obtained feedback from coworkers to ensure the completeness and accuracy of the procedures. The Locate Generator Faults assessment was determined to be inappropriate for use on SRM ships; the checks involved in this assessment represented tasks that were outside of normal operations, and introducing actual faults would pose risks to safety. Instead, the same engineer who revised the Prepare Main Engine procedure developed an entire Test Steering Gear procedure following the project's assessment development model.

In the trial assessments, the revised bridge assessment procedures were generally found to accurately reflect the proficiencies being tested, and the revised engine room assessment procedures were found to provide a highly accurate reflection of the relevant proficiencies and job skills. Appendices A through D contain the final versions of the assessment procedures for the bridge (Helmsman and Lookout) and for the engine room (Prepare Main Engine and Test Steering Gear).

Varying operational conditions

A key issue for the bridge assessment procedures concerned the testing of various conditions and events over time. For example, the Helmsman assessment calls for demonstration of the use of magnetic and gyro compasses in each of the following conditions: open waters, heavy weather, and confined waters. It is quite unlikely that all of these conditions will occur during a single watch period. Initial versions of the assessment procedures did not take this into account, and assessors did not know how to score missing information. The revised procedures provide a better means of dealing with such situations and were evaluated much more favorably.

Although the revision to the bridge procedures midway through the study offered a way to handle the general issues related to assessment conditions, this issue remains a critical one. In shipboard assessments, it is typically not possible to control the assessment conditions. If one requires the testing of a proficiency under a range of specified conditions, the assessment may take considerably more time or may be incomplete. In order for assessors to complete the assessments, it might require several periods of observation, perhaps over the course of a crewmember's tour. For such lengthy assessments, it would be particularly important to ensure that they would not become too cumbersome. In fact, such assessment is most likely only feasible provided that the assessments are fully integrated into the ship's operations, a point to which we shall return. Note that this issue is not specific to bridge operations but reflects the assessment procedures that were adapted for use in this study. Due to the nature of the assessment procedures developed and adapted, the engine room procedures were relatively easily integrated into ship's operations, involving procedures occurring on the ships on a very regular basis. In less highly proceduralized engine room proficiency areas (e.g., Locate Generator Faults), many of the same issues identified with the bridge assessments would likely be relevant.

Some crewmembers felt that even with careful integration into operations, testing proficiencies under numerous conditions might involve too much additional effort and might be unnecessarily redundant in some instances. As an example, the lookout was required to demonstrate use of the point system in reduced visibility, by day, and by night. It is indeed the case that assessing lookout proficiency under all three conditions provides a valid assessment of this skill. However, a valid assessment of proficiency in the use of the point system may not require

assessment under all three conditions. These are operational conditions that will be encountered onboard ship; however, a more critical question is whether using the point system in each condition requires a meaningfully different skill. If it does not, then assessment in each condition is redundant. Assessment objectives are established to reliably and validly test the skill of the mariner, not to meet the operational conditions of the workplace. With more experience with assessment, it may be possible to more sharply focus on the critical elements of the mariner proficiency and to eliminate concern with what is less critical. Appropriate subject matter experts might revise the trial procedures to be more streamlined. A suggestion made during the trials was that the assessment procedures might simply allow for a careful record of the conditions under which demonstration occurred. Revised procedures might indicate where demonstration under multiple conditions is necessary and where it is only necessary to record actual conditions. Some assessment objectives may require conditions that cannot be met onboard ship. As an example, the demonstration Locate Generator Faults was deemed impractical for shipboard. When conditions cannot be met onboard ships, simulators allow for multiple and novel conditions. The Conclusions and Recommendations section includes a discussion of the relative strengths of shipboard and simulator testing and of the possible necessity of combining assessments.

Providing operational detail

In addition to concerns about the specification of assessment conditions, some bridge crewmembers felt that aspects of the Helmsman and Lookout assessments were not realistic in that they did not reflect actual operational requirements and procedures. Although the revision to the procedures addressed many of these issues, deleting or changing inappropriate items (e.g., demonstrate the ability to take a bearing using bearing/gyro repeater in the Lookout assessment), some participants had problems with remaining assessment items. For example, the Helmsman procedure contains questions regarding the steering pump controls and steering motor controls, which may often be outside the scope of the helmsman's job. Some items in the Lookout procedure – for example, demonstrate understanding of lookout watch relief procedure – were considered by some to be so basic as to not be useful. Adaptation of procedures to a particular setting should include a careful review of all items to ensure their relevance.

Most participants found the level of detail in the assessment procedures to be appropriate. However, there were some comments and questions regarding how specific the engine room assessment procedures, in particular, should be. The engineers involved in the study felt they must either be almost specific to the particular ship, or at least to the type of equipment, or must simply provide a template of assessment objectives which would refer to vessel operating procedures. Provided that the vessel operating procedures are adequate and accurately followed, this approach could be feasible. However, it was more commonly felt that the assessments would be most useful if they included specification of the measures and standards within the assessment procedures. This approach requires developing complete and valid assessment procedures that address the type and level of equipment to be used. Most likely, procedures would then require verification and slight adaptation for particular ships. This issue was encountered specifically within this study, as discussed below.

For the three ships with similar equipment, the assessments adapted for the study proved to be highly effective and required minimal modifications. These modifications were limited to slight differences in operating procedures and practices aboard the ships. For the one ship with a

different main engine, fairly substantial tailoring of the assessment materials was required. In this case, the engineer who revised the Prepare Main Engine procedure was the assessor; he reviewed and adapted the Prepare Main Engine assessment procedure in its entirety prior to conducting the assessments (the Test Steering Gear procedure also required some adaptation). Specifically, as opposed to the slow speed diesel engines on three of the ships, this fourth ship had a medium/high speed diesel engine, which generally has much simpler operating procedures. The overall objectives for the assessment procedure remained the same, but several of the actions involved were eliminated or altered, thereby requiring the relevant performance measures and standards to be updated. For example, the medium speed diesel has a different cooling system that does not require the substantial checks needed on the slow speed diesels. In addition, it is worth noting that the ship's operating procedures and layout of equipment will largely dictate the order in which the actions involved in the assessment are performed.

Training and Preparation of Assessors

Training and preparation provided

Assessors with two levels of training were involved in these trial implementations. Four assessors – two in the bridge department and two in the engineering department – received training from us either in the form of a half-day workshop or comparable training. The workshop covered basic issues related to conducting valid and reliable assessments, reviewing one assessment procedure in some detail as an example. The trained assessors came aboard the first two ships specifically to conduct trial assessments. An additional four assessors received no specific training but instead worked directly from revised manuals and procedures during the second half of the study. These assessors were *part of the ship's regular crew and conducted the trial assessments in addition to their other duties*. Partly because of the limited training provided to assessors, we designed a comprehensive Assessor's Manual. Note that following the study we revised this manual both to reflect lessons learned and to be appropriate for a wider audience. Chapter 2 contains a copy of this revised Assessor's Manual.

Training and preparation needed

An important finding was that no major differences were found in the ability of the two groups of assessors (assessors with some training who came onboard for the assessments versus untrained assessors who worked from manuals and were regular ship's crewmembers) to conduct assessments. Our observations of the assessments, and feedback from the assessors, indicated that even assessors who only reviewed the Assessor's Manual and assessment materials were able to successfully conduct the assessments, applying the procedures and process with only minor difficulties at most. This finding suggests that their preparation was adequate and that the assessor's manual and procedures were indeed comprehensive.

Our findings show that assessor training can be minimal *provided that* assessment procedures are sufficiently specific, detailing what the assessor must do before, during, and after the assessment. Further consideration should be given to whether the individual assessment procedures should contain much of this detail or whether an assessor's manual should be adapted and used. Some participants in this research requested that as much of the assessment information as possible be in one place, rather than having to search for guidelines to assessment in multiple places. We

provide an overview of the assessment process and issues in the Assessor's Manual, and include details and specific guidelines within individual assessment procedures.

The Process of Conducting Assessments

Details of the onboard trial assessments

The trial assessments required soliciting the assistance of crewmembers to serve as assessment "candidates." Approximately half of the candidates were from the bridge department and participated in the bridge assessments (Helmsman and Lookout). Due to the nature of the assessments selected and of the shipping industry, the bridge candidates were generally Able-Bodied Seamen (ABs). The engineering candidates were officers, typically 2nd and 3rd Engineers, from the engine department who participated in the two engine room assessments (Prepare Main Engine and Test Steering Gear). Our original research plan had called for both experienced and inexperienced crewmembers to serve as candidates. However, due to crewmember availability, most trial assessments involved experienced crewmembers, resulting in a very high level of overall experience (average of 14.84 years with SRM, 18.36 years in maritime industry).

The trial assessment process itself first involved an introduction to the research study by us and/or by SRM assessors. The candidate was then briefed by the assessor on the assessment purpose and procedures. Following this briefing, the trial assessment took place. We attempted to observe as many of these trial assessments as possible. After completion of the trial assessment, the assessor debriefed the candidate. Candidates and assessors were asked to complete questionnaires for the purposes of the study; when possible, we also interviewed candidates and assessors. Research materials are included in Chapter 2.

A total of 39 trial assessments, involving 12 bridge candidates and 10 engineering candidates, were conducted between October 1 and December 17, 1999 on the four participating SRM vessels. These included 11 assessments using the Helmsman procedures (bridge), 9 with the Lookout procedures (bridge), 9 involving Prepare Main Engine (engine room), and 10 with Test Steering Gear (engine room). Most bridge candidates participated in both trial bridge assessments, and most engineering candidates participated in both trial engine room assessments.

Trial assessment conditions

The conditions for the trial shipboard assessments were dictated by the individual procedures and by the ship's operations. The bridge assessments were typically conducted during restricted waters maneuvers—which provided sufficient need for vessel navigation for the Helmsman procedure and sufficient reportable objects for the Lookout procedure—with very minimal interference on the part of the assessor. Thus for the main portion of the Helmsman assessment, the assessor would unobtrusively observe the helmsman on the bridge; and for the main portion of the Lookout assessment, the assessor would observe or listen to radio communications with the lookout on the bow. Following observation of the assessment, usually immediately following the candidate's watch, the assessor would ask the candidate the relevant knowledge questions from the assessment procedure, as well as clarify any actions observed during the assessment. The assessment debriefing followed.

The engine room assessments were conducted during slightly extended normal pre-departure checks of the main engine and steering gear, with a minimal to moderate level of interaction between assessor and candidate. The assessor would typically follow the candidate along throughout the rounds and ask questions regarding what was being done, as required. The assessor would end the assessment with any additional questions of clarification and knowledge questions from the procedure, followed by the assessment debriefing.

We have remarked that assessments involving demonstration under a variety of conditions, as was the case for the bridge assessments in this study, will most likely involve assessment over some extended period of time, capitalizing on varying conditions as they occur. This issue must be addressed in the initial briefing of the candidate. For example, if a candidate is determined to be ready for the Helmsman assessment, the assessor might brief the candidate toward the beginning of his or her tour and complete the assessment over the course of that tour. The assessor should inform the candidate that he or she would be observed, as appropriate, when conditions permit.

Participant response and approaches to trial assessments

Overall, the response to the trial shipboard assessments was quite positive. In questionnaire responses, interviews, and informal discussion, the overwhelming majority of crewmembers responded that shipboard assessments are feasible and appropriate. Some crewmembers, particularly those who served as assessors, stated that they believe shipboard assessments to be not just appropriate but critical to the implementation of STCW requirements.

Most critically, the assessors who were regular ship's personnel found the assessments to be feasible. For the bridge assessments, such assessors were typically on watch, assessing the ABs who worked their same watch periods. Sometimes this Mate observed ABs working another watch; in this case, the Mate was not then on watch him/herself but conducted the assessments as part of additional ship duties. In the engine room, the *candidate* was most often the watch officer at the time of the assessment. A senior engineer conducting the assessments would then observe the candidate during off-watch time, perhaps just after his or her own watch. In both of these two general cases—i.e., where the assessor conducted assessments while serving as watch officer and where the assessor conducted assessments as part of his or her collateral duties—onboard assessments were judged to be feasible and effective by the participants.

Even with the use of well-defined assessment procedures, different styles and approaches to assessment emerged in this study. For example, some engineering assessors found it awkward to make the engine room rounds while taking notes on a clipboard. Instead, they reviewed the procedures prior to the assessment, observed the entire process, and then reviewed the checklist thoroughly, checking off what they had seen and asking specific questions if they did not see an action performed, to ensure that the candidate performed all necessary actions correctly. In addition, there were varying levels of involvement in the assessment on the part of both bridge and engineering assessors. Sometimes, if appropriate and not interfering with operations, the assessor asked regular questions of the candidate during actual observation of the assessment. In other cases, the assessor postponed most questions until the end of the assessment, reviewing components of the assessment and asking questions wherever clarification was required. We observed several of these styles to be effective in conducting assessments. It is worth noting that the approach described here can be successfully adapted to the range of styles observed.

Crewmembers who served as either assessors or candidates naturally viewed the process from somewhat different perspectives and were asked questions to capitalize on these different views. Assessors who had to employ the adapted assessment procedures generally rated them as relatively easy to use and found them to provide valid tests of the relevant mariner proficiencies. Crewmembers who served as candidates in the assessment process typically found the assessments to be fair and thought they could be of at least moderate value to crewmembers being assessed.

General concerns regarding assessments

Crewmembers raised some general concerns in their discussions with us. One issue that emerged for both assessors and candidates was the assessment of experienced crewmembers versus newly hired personnel. As indicated above, the overwhelming majority of participants found the assessments to be appropriate and potentially quite useful; in many cases, however, they included the phrase “particularly for new hires.” Assessment of new hires in this manner was generally seen as a useful formalization and documentation of what would typically be covered with a new hire, providing an aid to this process. For some, conducting assessments was seen as a useful review and check for experienced crewmembers as well, as long as the process did not become cumbersome. But there was a definite concern over the appropriateness and usefulness of assessing highly experienced crewmembers in this fashion, particularly for repeated assessments (e.g., if assessed every few years). In this case, many crewmembers felt repeat assessments of experienced crew should be highly simplified, focusing on critical tasks only and not requiring demonstration of the skill under all possible conditions. Several participants indicated that a more involved assessment would again be appropriate when crewmembers were advanced to a new position or moved to a different type of ship.

Participants also wondered who would be responsible for developing the various assessments of critical proficiencies. In some cases—in particular the two bridge assessments and the template for the Prepare Main Engine assessment—the procedures developed by the academies served as a useful starting point for adaptation. Crewmembers with relevant shipboard experience were able to revise items to reflect the tasks and operations aboard their ships; in addition, the checklist format was adapted to be more useful. The assessment development model that resulted from an earlier phase of this project also provided a useful tool; a senior engineer was able to use this to develop an effective assessment procedure. Still, these efforts took some time, and questions about how to most efficiently develop additional assessment procedures must be addressed. A further concern raised by a few crewmembers was how to ensure compliance. These crewmembers felt that some companies would be good about complying in the full spirit of the assessment process while others might not. It was suggested that some form of “watch group” might be needed to ensure appropriate compliance.

Integrating Assessments into Operations

A key issue in this research was whether shipboard assessments could be conducted without interfering with the safety and effectiveness of operations. In observations and discussion with the crew, we found that the assessments could be conducted so as to involve minimal interference with ship’s operations provided that they were integrated with ship’s operations. Overwhelmingly, participating crewmembers agreed with this observation. However, assessors

in particular offered the caveats that interference was minimal *only so long as* additional training and paperwork were kept to a minimum. They also recommended further integrating the process and procedures into normal operations. Integration with operations was particularly important when assessments were conducted by regular crewmembers. Assessors stressed simplification and streamlining of the process as well. Specific suggestions were to create a comprehensive assessment checklist for each assessment, with minimal attached instructions and documentation, and potentially to integrate assessment records with crewmember Certificates of Discharge.

Obviously, it is important to ensure that no crewmembers are overly burdened with additional duties. While integration of assessments with ship's operations will help, this issue will need to be specifically addressed in the future, particularly if numerous assessments are to be conducted. If the process of conducting assessments is spread over numerous senior crewmembers, assessments might be integrated with minimal added work. In this event, it will be particularly critical for assessment procedures to be clear and comprehensive, as well as to be streamlined with operations. If assessments are to be conducted or organized by only one or two crewmembers within a ship's department, these crewmembers will most likely have to be relieved of other duties in order for workload to be manageable. A major disadvantage of this alternative is that duties would have to be reassigned. Finally, companies might consider having trained crewmembers come aboard ships to conduct assessments. This alternative offers the advantages of not increasing the workload of the normal crew as well as providing a more standardized approach, but would involve hiring additional personnel and might pose scheduling and other problems.

For the assessment procedures used in these trial assessments, there was a more natural integration of the engine room assessments into operations. This process was generally quite smooth, with assessment procedures reflecting engine room operations that occurred on a highly regular basis. The engine room assessments typically required only some advance preparation on the part of the assessor, the time required to make the engine room rounds and follow up with questions, and the beginning of normal pre-start checks a little earlier than usual. More effort was required to find the right approach to the bridge assessments. In order to be effective, additional consideration regarding assessment conditions and scheduling was required. Again, this was largely due to the particular assessment procedures that were used. An engine room procedure that is less well controlled would result in many of the same difficulties. Likewise, a bridge procedure that is specific—perhaps operation of a piece of equipment such as the Automatic Radar Plotting Aid (ARPA)—could likely be more easily integrated into operations. Procedures that are less well integrated and controlled may be prime possibilities for assessment via simulators or training courses, complementing shipboard assessments done for highly regular job functions.

CONCLUSIONS AND RECOMMENDATIONS

The present report describes the fourth and final phase of a research project that examined the technical nature of mariner assessments that are fully compliant with the requirements of the STCW Code (IMO, 1996B). Our objective was to ensure that the most relevant methods of Instructional System Development (ISD) and the best practices of the maritime industry were readily available to those responsible for developing, conducting, reviewing, or approving assessments. The conclusions in this section draw not only on the findings of this last phase, but also on the earlier phases. These earlier phases were briefly summarized in the introduction, along with citations for the technical reports that describe them in detail.

A Scenario for Conducting Successful Shipboard Assessment

The major focus of this phase of the project was a trial application of our assessment approach conducted with SeaRiver Maritime, Inc. onboard four of their tankers. Deep-draft commercial vessels were selected based on the expectation that the difficulty and complexity of this setting would allow us to identify many of the critical issues that the industry as a whole would encounter. We assisted SRM personnel in adapting and preparing existing procedures, training their ship's officers in assessment, conducting the trial assessments, and considering requirements for integrating assessments into ship's operations. We found that these aspects of assessment are quite interdependent, with tradeoffs in resource requirements among them. The assessment procedures were adapted to the equipment and operations of each ship, and highly detailed assessment materials were prepared, with built-in instructions to guide the assessor. With such tailoring of the assessment procedures, and with a concise manual that addressed practical considerations in conducting assessments, ship's officers were able to conduct the assessments with a minimum of training. When the process was sufficiently refined, ship's officers were able to perform the assessments even while standing a watch.

The more procedural engine room assessments (Prepare Main Engine and Test Steering Gear) were more easily integrated into operations than the less predictable bridge assessments (Lookout and Helmsman). Assessment conditions in the bridge assessments were difficult to control and could not all be observed within a single assessment session. Overall, we concluded, with SRM, that implementation of successful shipboard assessments requires thoughtful integration with company standing orders, ship's operations, company training, records, and certificates of discharge. Companies must be responsible for minimizing the burden on the ship's officers, with guidance and assistance from IMO, USCG, and other sources.

A Review of Settings and Proficiencies Examined in the Project

Over the last few years, we have developed a number of sample assessments of mariner proficiency. While in each case our objective was to examine the *process* of development rather than the proficiency assessment itself, developing these assessments provided important lessons that contribute to our general conclusions in the next section. A brief description of each assessment, along with a report citation, follows.

- *Rules of the Road.* For an investigation of the value of an interactive test as a replacement for a pencil and paper test, we developed a sample desktop simulator-based test of a mariner's ability to apply Rules of the Road knowledge. We needed to design a test that would allow the candidate to demonstrate problem-solving in unpredictable conditions. We found that a successful test of such ability required a great deal of prior preparation of short, focused exercises and targeted performance measures. (See Smith, Sandberg, McCallum, Stewart, Hard, Meurn, & Baker, 1996.)
- *Automatic Radar Plotting Aid (ARPA).* We developed an STCW-compliant sample assessment of ARPA operations, using a high-fidelity simulator with real equipment. Again, we found that assessing problem-solving in a complex situation requires extensive prior preparation of exercises and measures. We also evaluated the capability of mid- and low-fidelity desktop simulators to substitute for the high-fidelity simulator and found that they could not support a complete assessment; assessment would have to be supplemented in other settings. (See McCallum, Forsythe, Smith, Nunenkamp, & Sandberg, 2000 and Raby, Forsythe, McCallum, & Smith, 2000.)
- *Lookout.* The present report describes Lookout assessments on a full-mission, high-fidelity simulator; a training ship; and commercial ships. We found that all these settings could support successful assessments of *basic* skills. However, a complete Lookout assessment depends on extended observation and the availability of all required conditions. In any setting, implementation will require planning and record-keeping to insure that an individual is assessed in all required conditions. More than one setting may be required to complete the planned assessment objectives discussed in this report.
- *Helmsman.* The present report also describes Helmsman assessments on a full-mission, high-fidelity simulator; a training ship; and commercial ships. The issues of extended observation and available conditions are similar to those for Lookout assessment. In addition, the ship size and controllability are considerations for assessing steering ability discussed in this report.
- *Locate Generator Faults.* The present report describes a single, very preliminary trial on a simulator. The exercise was not highly structured and both the instructor and the candidate introduced unpredicted elements into the unfolding events. The results verified our findings with other non-procedural problem-solving proficiencies that more structure was needed to ensure consistent assessment discussed in this report.
- *Prepare Main Engine.* The present report describes assessment trials on both a training ship and commercial ships. In both cases, we found that this assessment, which requires well-defined steps and standards of performance, could be conducted effectively in the shipboard environment. Successful assessment required adaptation of the assessment procedures to the equipment and operations of the particular vessel discussed in this report.
- *Test Steering Gear.* The present report describes assessment trials on both a training ship and commercial ships. As with the Prepare Main Engine assessment, this highly procedural proficiency could be integrated into the shipboard environment, once the assessment procedures had been adapted to the equipment and operations of the particular vessel discussed in this report.

General Principles for Conducting Successful Assessments

Thorough preparation is a necessary prerequisite for assessment. The structured approach developed and tested in this project advocates a thorough specification of the assessment objectives to guide the selection of methods, design of conditions, and development of proficiency criteria. For discussions of this structured approach, see McCallum, Forsythe, Nunnenkamp, Sandberg, and Smith (2000) and McCallum, Forsythe, Barnes, Smith, Macaulay, Sandberg, Murphy, and Jackson (2000). If assessors are to receive minimal training in conducting assessments, preparation must include providing sufficiently detailed guidelines for conducting assessments in a manual or assessment procedures. Alternatively, assessors may be more highly trained such that they are able to effectively conduct assessments as long as objectives, conditions, performance measures, and proficiency criteria are specified. In both cases, assessors must also consider required conditions and scheduling constraints in preparing for assessments.

Select settings based on their suitability for the assessment of particular proficiencies. The assessment procedures were adaptable to each of the settings that we explored – simulator, training vessel, and commercial ship – to varying degrees. Simulators may be most appropriate when assessments call for greater control in establishing assessment conditions. For example, various types of targets could be presented under different conditions of visibility for the Lookout assessment. When assessment of problem-solving under very specific or infrequent conditions is to be assessed, simulators show their greatest strength. Training vessels may offer an advantage in providing basic assessments of a large number of candidates and dedicating time for assessment. This advantage was especially true for the highly procedural Prepare Main Engine assessment during an extended training voyage. Finally, assessment onboard commercial vessels can be successfully implemented and may be most appropriate for assessments requiring specific equipment or concerned with ongoing operations. The general caveat for assessment on commercial vessels is that it must be integrated into the ship's normal operations and must pose minimal additional demands on the assessor and the candidate. Our trial applications revealed potential limitations to any setting; neither training nor commercial vessels met all of the requirements for even the handful of assessments we examined. A given assessment platform must be evaluated to determine the extent to which conditions can be controlled and candidate performance observed to meet the requirements of a particular assessment procedure.

It may be necessary to combine assessments over sessions, transits, or even settings. It may be that planned assessments cannot be completed in one session on a simulator, one transit on a ship, or even within a single setting. All the necessary conditions may not be available as needed. During the academies' simulator trials, they did not have enough time to cover all of the necessary conditions; during their training ship trials, not all of the necessary conditions occurred. In the shipboard trials, assessors discovered a need for a modification to their checklists to indicate "condition not available" because, again, not all of required conditions were observed during a single session. Our evaluations of desktop ARPA simulators, showed that they were also not able to provide all the conditions needed for the assessments (Raby, Forsythe, McCallum, & Smith, 2000A). Even for a simulator that is highly capable, if the assessment of an understanding of manufacturer-specific controls is planned, a simulator with the equipment of a different manufacturer will not support a complete assessment. A consideration of mechanisms to keep records and combine results for an individual was not included in this project, but assessment programs will need to make such provisions.

Recommendations for Implementation of the Findings and Products

The NMC-sponsored R&DC project produced a range of findings and products to support structured STCW-compliant assessments based on practical demonstration. The following recommendations apply to the contents of this report and to those reports from earlier phases of the project. The following actions will result in the most effective implementation by the USCG and the maritime industry.

- The USCG should encourage the maritime industry in the use of the project's findings and products. As a first step, the materials should be made widely available, on the USCG STCW website (<http://www.uscg.mil/stcw>) and through the National Technical Information Service (NTIS). Potentially, the materials could serve as the basis of a Navigation and Vessel Inspection Circular (NVIC). The USCG should submit the component materials to the IMO subcommittee on Standards for Training and Watchkeeping.
- The USCG should encourage further familiarity with the structured approach by USCG staff, as a tool for discussions of assessment with the industry and for the review of procedures submitted for approval.
- The USCG should encourage the review and use of the method and materials by those groups that are dealing with the important technical issues of assessment. These include the Maritime Academy Simulator Committee (MASC), the Merchant Marine Personnel Advisory Committee (MERPAC), and academy committees appointed by the Maritime Administration (MARAD) to address STCW issues. The materials can provide a common approach and a common basis for discussion.
- Those in the industry who are responsible for training and assessment of mariner proficiency in academies, training schools, and shipping companies should make use of the method and the materials presented here as a guide for their own development of assessment procedures. The project materials are especially appropriate for inclusion in train-the-trainer and train-the-assessor courses. Shipboard assessors will find the Assessor's Manual Chapter 2 appropriate for their needs.

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CONDUCTING MARINER ASSESSMENTS

Chapter 2

ASSESSOR'S MANUAL FOR CONDUCTING MARINER ASSESSMENTS

This Manual is intended for assessors preparing to conduct over-the-shoulder assessments of mariner proficiencies. It was originally written to support shipboard trials of assessments by regular ship officers, who had little other training or preparation in assessment and little time to prepare. The version here has been substantially revised to benefit from lessons learned during the trials. The ship officers and researchers performing the trials concluded that a short, concise manual provides adequate preparation, provided it is accompanied by an assessment "package" prepared for their ship's procedures and equipment. The Manual will also be useful for others who are responsible for assessment, including instructors at training facilities or academies. It is appropriate for inclusion in train-the-trainer or train-the-assessor courses.

This report may be downloaded from the U.S. Coast Guard Research and Development Center web site at <http://www.rdc.uscg.mil>.

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INTRODUCTION

The STCW Challenge

Recent enactment of the *Seafarers' Training, Certification and Watchkeeping (STCW) Code* by the *International Maritime Organization (IMO)* has led to new requirements in conducting assessments of mariner proficiency. The STCW Code identifies a broad set of proficiency areas comprised of skills, knowledge, and abilities. It further directs maritime industries in its member nations to assess mariner proficiency in selected areas on the basis of practical demonstration. Assessors will be responsible for administering assessments to mariners and ensuring that valid and reliable results are obtained.

The Role of the Assessor

As an assessor, you will be responsible for assessing the ability of candidates to perform a task, duty, or responsibility properly. You will use established criteria and professional judgment to determine whether the candidate has demonstrated an acceptable level of proficiency. You will use assessment procedures that have been carefully developed, reviewed, and approved prior to the assessment. You should personally observe the mariner's performance and determine the outcome of the assessment.

An assessor should hold the level of license, endorsement, or professional credential required for the proficiency being assessed. In addition, the assessor should review the assessment materials and receive a basic introduction to techniques and issues associated with assessing mariner proficiency through practical demonstration.

Purpose of Manual

The purpose of this manual is to provide assessors with guidelines for conducting valid and reliable mariner assessments based on practical demonstration. This manual is not intended to provide comprehensive instruction in the full range of assessment issues. Rather, it is intended as a focused introduction and reference to selected factors that affect validity (job criticality) and reliability (consistency) while conducting such assessments.

The process and guidance presented in this manual conform to international standards and domestic regulations, especially the IMO's STCW Code and the U.S. Coast Guard's Navigation and Vessel Inspection Circulars (NVICs) that address implementation of the STCW Code within the United States. The reference section of this manual lists specific STCW documents, applicable NVICs, and other source documents that can be referred to for more detailed guidance in developing and conducting mariner assessments based on practical demonstration.

Components of an Assessment Procedure

Any assessment procedure that is designed to meet IMO and U.S. Coast Guard requirements for practical demonstration of mariner proficiency will typically be comprised of several common components: *assessment objectives*, *assessment conditions*, *performance measures*, *performance standards*, and *scoring procedures*. As an assessor, you should familiarize yourself with these components, referring to the specific assessment procedures you will be using.

When conducting an assessment, you will evaluate a candidate's ability to meet pre-defined *assessment objectives*. These objectives can be derived from the STCW Code and U.S. regulations, as well as technical manuals, job instructions, textbooks, and task analyses. Each assessment objective consists of one or more separate actions. An example assessment objective from a Lookout assessment is "describe lookout duties and responsibilities." As part of this objective, the candidate must demonstrate knowledge of the procedures for reporting sightings, including identifying and describing the procedure and reporting all relevant information. An example objective from a Prepare Main Engine for Operation assessment is "perform engine auxiliaries pre-start checks." To meet this objective, one action the candidate must perform is to determine the status of the main engine controls and ensure that they are appropriate for starting the main engine.

The candidate's performance on the stated assessment objectives will be evaluated under various *assessment conditions*. Conditions for the Lookout assessment, for example, include the presence of appropriate targets to be sighted, clear visibility during daylight and at night, and restricted visibility. The assessment conditions will be explicitly defined in the assessment procedures.

Each assessment objective will have one or more corresponding sets of performance measures and performance standards. *Performance measures* include observation and recording of specific mariner actions, or the outcome of those actions. Table 2-1 below provides a sample of mariner actions, performance measures, performance standards, and a scoring checklist from a Helmsman assessment procedure. It shows three of the five actions for the assessment objective "Demonstrates use of magnetic and gyro compasses in open waters." The first performance measure in this table is "Report of compass comparison," which is measured when assessing the action "Compare and report course by gyro and magnetic compass after a course change." Here, the assessor is required to record the mariner's report of the compass comparison, then apply the corresponding performance standard.

Performance standards specify the level of performance that is considered an acceptable or target level. Continuing with the example in the first row of Table 2-1, there are two performance standards that are to be applied in scoring the corresponding performance measure. In this case, the mariner is required to both: (1) make a report after the course change and (2) provide a reported magnetic reading that is ± 2 degrees of actual.

Scoring procedures are used in scoring individual actions, as well as sets of scores to determine the outcome of performance assessments. Both of these types of scoring procedures should be explicitly defined in the assessment procedures. Pass/fail is the most common scoring procedure for individual actions. In this case, a candidate obtains a passing score for an action by passing all performance standards corresponding to that action. Scoring procedures applied to sets of multiple scores will most commonly be based on some range of acceptable scores. However, assessments often involve critical objectives that must be passed or the candidate fails the entire assessment. For example, a candidate undertaking an assessment of his ability to start the main engine must be able to correctly place the emergency stop valve in the run position. This action is essential to safe job performance, so a candidate must be able to perform it to pass the assessment.

Table 2-1. Example of Actions, Performance Measures, and Performance Standards from the Helmsman Assessment

Action	Performance Measure	Performance Standard	Score
Compare and report course by gyro and magnetic compass after a course change.	Report of compass comparison.	Performance meets all standards: ☐ Report after course change. ☐ Reported magnetic reading to be +/- 2 degrees of actual.	☐ Pass ☐ Fail ☐ N/A
Compare and report course by gyro and magnetic compass periodically.	Report of compass comparison.	Performance meets all standards: ☐ Report at the time interval specified in the standing orders or company policy. ☐ Comparison of gyro and magnetic compass to be unprompted by assessor/watch officer if consistent with company procedures. ☐ Reported magnetic reading to be +/- 2 degrees of actual.	☐ Pass ☐ Fail ☐ N/A
Steer by magnetic compass in moderate weather.	Maintain a steady course.	☐ Course to be maintained at +/- 5 degrees of ordered course for 30 minutes, relying solely upon the magnetic compass. In adverse winds or current, allowance can be made for a less stringent standard.	☐ Pass ☐ Fail ☐ N/A

Overview of the Assessment Process

You should follow the same basic series of five steps in conducting an assessment, even if you are conducting assessments of a number of mariner proficiencies. The first step is to prepare for the assessment by reviewing and ensuring the required assessment conditions and scheduling the assessment at an appropriate time (e.g., at night for certain Lookout objectives). The second step is to brief the candidate before the assessment. This involves verifying the candidate's readiness to undertake the assessment and then briefing the candidate on the assessment objectives, measures, standards, and scoring. The third step involves observing the candidate's performance during the assessment and recording the results. For the fourth step, the assessment outcome is determined by scoring each performance measure and tallying the scores across objectives. The fifth and final step is to debrief the candidate following the assessment. Figure 2-1 depicts the steps involved in conducting an assessment.

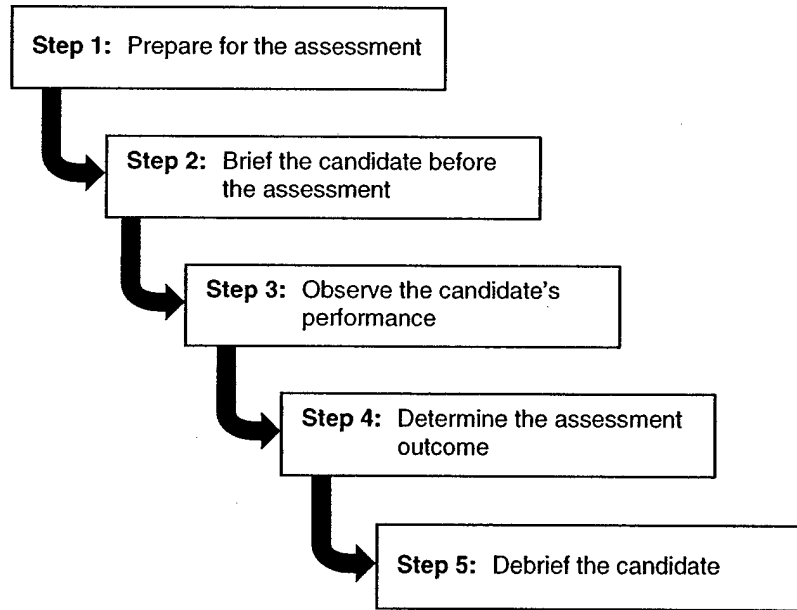


Figure 2-1. Steps involved in conducting mariner assessments based on practical demonstration.

The remainder of this manual consists of guidelines for conducting mariner assessments. The guidelines are organized around the five steps involved in conducting mariner assessments. At each step, guidance is provided regarding factors to consider in preparing for and conducting assessments, followed by a general checklist of issues to consider.

Guidelines for Conducting Mariner Assessments

As an assessor, you should always strive to conduct valid and reliable assessments. An assessment is *valid* when it accurately measures the job-critical knowledge, skills, and abilities required for proficient job performance. An assessment is *reliable* when it consistently obtains the same results across mariners with comparable skills.

How do you know if you are prepared to conduct a valid assessment that will accurately measure the job-critical knowledge, skills, and abilities required for proficient job performance?

Your assessment will be valid if the conditions of assessment reasonably reflect a representative range of working conditions and requirements. Some questions you should consider in determining whether you are prepared to conduct a valid assessment are listed below.

- Will the assessment be conducted under realistic working conditions that adequately assess the mariner's abilities to perform his or her duties on the job?
- Will the mariner be required to demonstrate the skills and knowledge that are identified in the assessment as critical to proficiency?

- Will the mariner be required to rely on his or her own skills and knowledge?

How do you know if you are prepared to conduct a reliable assessment that will consistently obtain the same results across mariners with comparable skills?

Your assessment will be reliable if you carefully follow prescribed assessment procedures that are designed to ensure consistent results from one assessment to the next. Some questions you should consider in determining whether you are prepared to conduct a reliable assessment are listed below.

- Have you reviewed the instructions in the assessment package to ensure that you are prepared to carefully follow prescribed assessment procedures?
- Will you provide the candidate with a complete set of instructions and answer any appropriate questions that he or she may have?
- Are you prepared to accurately observe and record all mariner performance, as instructed in the assessment package?

Step 1: Prepare for the Assessment

Ideally, you should begin preparing for an assessment several days before it is scheduled. The first activity is to coordinate the assessment with the candidate(s) to ensure that they are properly prepared and qualified to take part in the assessment. Each assessment procedure should specify candidate prerequisites for assessment, in terms of prior training, experience, licenses, and successful completion of other related assessments. If these are absent, they should be discussed and established by those responsible for assessment in your organization. You should verify that a candidate meets all prerequisites for an assessment. In addition, you should determine that a candidate is scheduled to be onboard for an adequate period of time to complete the assessment, which will range from an hour to days or weeks, depending upon the specific assessment procedures.

The second activity involved in preparing for the assessment is to consider and plan for the required conditions. Carefully read the assessment conditions listed in the assessment procedures. Prior to conducting an onboard assessment, check your passage plan to determine when the required conditions might be present. Plan to schedule your assessment to match the availability of these conditions, if possible. Common conditions that can often be planned for in advance are being underway at sea, maneuvering in restricted waters, or being moored. Other conditions, such as restricted visibility or heavy seas, cannot be planned for in advance and can only be taken advantage of when the conditions arise. When you have prepared a schedule, inform the candidate(s), the relevant watch officer(s), and other personnel of the date and time(s) of the assessment so that they can plan their activities accordingly.

The third preparatory activity is to check all equipment required for the assessment and ensure that it is operational and available. The assessment procedures should specify the equipment required to assess a particular proficiency. If an engineering assessment involves checking equipment status, make sure you know the normal range for each variable and record this information so that you can refer to it during the assessment. As part of your check of equipment, you should also review all applicable safety precautions and procedures to ensure full adherence to them.

General Checklist for Assessment Preparation

- ☐ Gather and review all assessment materials.
- ☐ Verify that the candidate meets the assessment prerequisites.
- ☐ Check the candidate's duty schedule.
- ☐ Ensure that the appropriate conditions will be present for the assessment.
- ☐ Schedule the assessment and inform all affected personnel.
- ☐ Prepare the assessment area(s).
- ☐ Prepare and arrange the necessary equipment, and ensure that it is operational.
- ☐ Determine the necessary safety precautions.

Step 2: Brief the Candidate before the Assessment

The pre-assessment briefing should take place at least one day prior to the assessment (earlier if at all possible). This will help both you and the candidate to be well prepared for the assessment. During this briefing, you should provide the candidate with a copy of the Candidate Instructions and Assessment Control Sheet. The *Candidate Instructions* are instructions prepared especially for the candidate, focusing on the issues that will be of concern to that individual. The *Assessment Control Sheet* summarizes the assessment objectives and all of the actions required for each objective. It is also the document on which you will record the candidate's final scores for each objective.

Begin the briefing with a discussion of the candidate's prior experience, training, and qualifications. At this time, you should verify that this candidate is both qualified and willing to undertake the assessment. If you both agree the candidate is ready for the assessment, then continue with the assessment process. If not, arrange for additional on-the-job or simulator training and set a date for another review of the candidate's qualifications.

Review the conditions of the assessment with the candidate. Specifically, discuss the different operational conditions under which assessment will occur. You should also discuss the period of assessment. Some assessments can be completed in a single, relatively brief period of time. Other assessments require repeated observation, taking advantage of available conditions, such as restricted visibility, as they occur.

Safety is of paramount concern during the assessment. Because of this, you should remind the candidate that it is permissible to ask questions during the assessment. This can help to reduce the risk of an unsafe act during the course of the assessment. For all assessments, ensure that the candidate has the proper equipment to carry out the assessment. Inform the candidate that an assessment will be stopped at any time if you, the assessor, judge that safety conditions are being violated for any reason.

General Checklist for Briefing the Candidate before the Assessment

- ☐ Provide the candidate with copies of the Candidate Instructions and Assessment Control Sheet.
- ☐ Discuss the candidate's readiness for the assessment.
- ☐ Review the Candidate Instructions with the candidate and answer any questions.
- ☐ Discuss the desired outcome(s) and consequences of failing to perform part or all of the assessment.
- ☐ Advise the candidate of the conditions and schedule of the assessment.
- ☐ Review the circumstances under which the assessment will be terminated, due to safety concerns.

Step 3: Observe the Candidate's Performance

The third step in the assessment process is to observe the candidate's performance during the assessment. Remember that you must continuously observe the candidate. Throughout the assessment, require the candidate to adhere to standard procedures, except when assessment procedures require demonstration of knowledge or skills different from those standard procedures. For example, a company may use points to report sightings, but a candidate may also be asked to demonstrate knowledge of the relative bearing system as part of the Lookout assessment.

Specific assessment objectives, performance measures, performance standards, and scoring procedures will be included in each assessment. Your consistent application of these procedures will ensure that you conduct a valid and reliable assessment. However, adherence to these procedures may require some flexibility on your part. Specifically, in some cases you may be required to remember the performance of the candidate for some time before you are able to record and score his or her performance. In addition, there may be times during the assessment when you will need to ask the candidate what he or she is doing. You should try to limit your questions during the candidate's performance, so that you minimize the amount of coaching the candidate receives from you.

Typically, an assessment will include a number of questions regarding the candidate's knowledge of rules and procedures pertaining to the duties under assessment. In addition, there will commonly be a number of questions regarding the candidate's performance that must be asked for clarification. Generally, a good time to ask all of these questions is following the candidate's demonstration of practical skills. At this point, you can ask specific questions you have about the performance you observed and use these questions as introductions, when appropriate, to more general questions about knowledge and rules included as part of the assessment.

Remember that, in order to maintain assessment validity and reliability, candidates should be assessed on their ability to perform their job tasks and duties and to demonstrate their knowledge of job procedures and rules. Avoid training candidates to successfully complete an assessment rather than proficiently perform their job. Also avoid allowing candidates to observe

assessments of other mariners when this will provide them with an unfair advantage during subsequent assessment.

Finally, it is important to remain constantly vigilant regarding operational effectiveness and safety. Assessments should be conducted only where they do not adversely affect the normal operation of the ship. In addition, assessments must be terminated whenever safety conditions are being violated.

General Checklist for Observing the Candidate's Performance

- ☐ If a safety violation occurs, terminate the assessment immediately.
- ☐ Ensure that the candidate can concentrate on the task at hand.
- ☐ Do not allow other crewmembers to interfere with the assessment.
- ☐ Ensure realistic assessment conditions with a normal working environment.
- ☐ Continuously observe the candidate during the assessment. Record the observed performance and apply the performance standards as soon as practical during the assessment.
- ☐ Require that standard procedures be adhered to, except when assessment procedures require demonstration of knowledge or skill different from these procedures.
- ☐ Avoid asking leading questions. Try to keep your questions fair but general in nature.
- ☐ Avoid giving the candidate unsolicited assistance, but respond to appropriate questions and provide appropriate equipment when required.
- ☐ Remain objective and maintain positive control of the operation at all times.

Step 4: Record Results and Determine Assessment Outcome

The fourth step in the assessment process is to determine the assessment outcome. To do this, record the candidate's performance on each *Assessment Worksheet* and then apply the scoring procedures specified in the assessment procedures. Remember that if the candidate incorrectly performs any of the critical, required actions, he or she automatically fails the entire assessment. Finally, determine and document the outcome of the assessment, transferring the final results to the *Assessment Control Sheet*.

You will probably have some additional paperwork requirements that have been specified by your organization. This will likely involve the maintenance of personnel records within your organization. In addition, upon successful completion of an assessment by a candidate, you will need to make the appropriate entries in the *Training Record Book* that has been adopted by your organization as a means of documenting fulfillment of the corresponding STCW requirements by the mariner.

General Checklist for Determining Assessment Outcome

- ☐ Record performance on the appropriate *Assessment Worksheet*.
- ☐ Adhere strictly to the prescribed performance standards and scoring procedure(s).
- ☐ Determine and document the outcome of the assessment, then transfer the final results to the *Assessment Control Sheet*.
- ☐ Attest to successful demonstration of tasks in the *Training Record Book (TRB)* or other record, as appropriate.

Step 5: Debrief the Candidate

The fifth and final step in the assessment process is to debrief the candidate as soon as possible after the assessment. During this debriefing, you should restate the assessment objectives and discuss the candidate's performance on each objective. A good strategy for beginning a debriefing is to review the candidate's positive accomplishments. The candidate will then likely be in a better frame of mind to hear any comments regarding areas needing improvement.

If the candidate failed to demonstrate proficiency, you may work together with him or her to develop an improvement plan to prepare for reassessment. Conditions for conducting reassessments should be specified in the assessment procedure. If these are absent, they should be discussed and established by those responsible for assessment in your organization. Specific issues to consider are: (1) the period between initial assessment and reassessment, and (2) any changes in the performance standards and scoring procedures that are adopted for reassessment.

General Checklist for Debriefing the Candidate

- ☐ Debrief the candidate as soon as possible after the assessment.
- ☐ Restate the assessment objective(s).
- ☐ Focus on positive accomplishments first.
- ☐ Identify areas needing improvement.
- ☐ If the candidate failed to demonstrate proficiency, jointly develop an improvement plan to prepare for reassessment.

GLOSSARY

Assessor. Anyone who conducts an assessment or evaluation of an individual's proficiency. The term *assessor* is used in many discussions of STCW requirements, including the STCW Code and NVIC 4-97 on company roles and responsibilities. The term *designated examiner* is used for *examiner* in the United States implementing regulations.

Assessment. The process of evaluating whether an individual's performance meets established *proficiency criteria*. The terminology used for this process in the United States implementing regulations includes *examination* for knowledge, and an *assessment* based on *practical demonstration*, as witnessed by a *designated examiner*.

Assessment Conditions. The *assessment conditions* define the setting, tools, references, aids, and safety precautions that are required for an assessment of a candidate's proficiency.

Assessment Objectives. The goals for the performance-based assessment of proficiency based on the knowledge, skills, and abilities required by the job. A complete *assessment objective* description includes the required mariner performance, the conditions of assessment, and the standards of performance for successful accomplishment of the objective.

Assessment Procedures. The activities that are conducted in administering the assessment of a candidate's proficiency. The term *assessment procedure* can describe either the actions taken or the written instructions and activity descriptions that are used in conducting an assessment.

Designated Examiner. A person who has been trained or instructed in techniques of training or *assessment* and is otherwise qualified to administer performance assessment procedures. In practice, the *designated examiner* evaluates whether the candidate's performance meets established *proficiency criteria* to earn credit toward the license, document, or endorsement. Further details on the qualifications of *designated examiner* can be found in NVIC 6-97.

Duty. An ongoing responsibility within a job that usually requires the performance of multiple tasks (e.g., *Officer in Charge of the Engineering Watch, Lookout, and Helmsman*).

Evaluation Criteria. The *evaluation criteria* comprise the general *standards of competence*. In practice, the *evaluation criteria* are further defined on the basis of *performance measures*, *performance standards*, and *proficiency criteria*.

Job. An employment post consisting of a cluster of related work responsibilities and duties (e.g., *Chief Engineer, Third Mate, Able-bodied Seaman*). In the STCW Code, a job is further defined on the basis of licensure level (e.g., Officer in charge of a navigational watch on ships of 500 gross tonnage or more).

Knowledge. The learned concepts, cues, facts, rules, and procedures that are necessary for proficient performance of a task (e.g., *knowledge of algebra, knowledge of the Navigation Rules, knowledge of procedures for starting the main engine*).

Objective Measure. A measure that relies primarily upon measurement apparatus that can be calibrated to yield highly consistent and accurate measurement results.

Performance Measure. The procedures used for observing and recording mariner actions, or the outcome of those actions. *Performance measures* record either the process of performance or the product of performance.

Performance Standard. The standard established for individual *performance measures*. *Performance measures* and *performance standards* are combined on the basis of *scoring procedures* to establish *proficiency criteria* for an assessment objective.

Proficiency. An individual's demonstrated ability to meet job performance requirements, as established on the basis of *performance measures*, *performance standards*, and *proficiency criteria*.

Proficiency Criteria. The scoring procedures and standards applied in determining the proficiency level of a candidate on the basis of *performance measures* and *performance standards*.

Qualified Instructor. According to the United States implementing regulations: "the person who has been trained or instructed in instructional techniques and is otherwise qualified to provide required training to candidates for licenses, documents, or endorsements." Further details on the qualifications of *qualified instructors* can be found in NVIC 6-97.

Reliability. The *consistency* of a measurement procedure. In the context of assessment, *reliability* can be generally defined as the consistency of the assessment outcome when applied under comparable conditions. Reliable assessments have well-defined assessment conditions, administration procedures, performance measures, performance standards, scoring procedures, and proficiency criteria. The reliability of an assessment establishes the maximum level of assessment *validity* possible. That is, an assessment cannot be any more valid than it is reliable.

Scoring Procedures. The defined procedures for combining individual *performance measures* and *performance standards* that are conducted in the application of *proficiency criteria*.

Skills and Abilities. The behaviors that must be applied in successful performance (e.g., *typing skills*, *equipment fault-finding skills*, *navigation skills*, *shiphandling skills*). Measurable and observable skills are those of interest in proficiency assessment.

Subjective Measure. A measure that relies primarily upon an assessor's direct observation and interpretation of mariner performance to determine the assessment outcome.

Task. A single, observable work assignment that is independent of other actions and supports successful job performance. A task must be observable, be a complete work assignment, have a specific beginning and end, and be measurable by its intended product or outcome.

Validity. The extent to which a measure represents what was intended to be measured. In the context of assessment, *validity* can be defined as the degree to which successful completion of an assessment accurately predicts successful performance on the job. The maximum validity of an assessment is established on the basis of its *reliability*. That is, an assessment cannot be any more valid than it is reliable.

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APPENDIX A

MARINER ASSESSMENT PROCEDURES FOR THE PERFORMANCE OF HELMSMAN DUTIES

Blanchard, R. T., Hempstead, S. C., Murphy, J., and McCallum, M. C.

This appendix provides procedures used during the shipboard assessment trials performed by SeaRiver Maritime, Incorporated (SRM), with the assistance of the U.S. Coast Guard Research and Development Center. The procedures in this appendix were used in the trial assessment to assess a mariner's ability to act as helmsman. Included are assessor instructions, candidate instructions, four assessment worksheets, and an assessment control sheet for documenting the final results of the assessment.

SRM senior deck officers made minor revisions to a pre-existing assessment to be compatible with their company's procedures and ships' bridge operations, and had the new assessment procedures verified by colleagues. During the earliest trials, they made additional revisions to increase the detail and objectivity of the measures in order to facilitate assessment by regular officers standing regular watches. A more detailed discussion of their adaptation appears in Chapter 1, subsection *Adapting and Preparing Procedures for Use in Onboard Assessments*. The remainder of Chapter 1 contains numerous references to the importance of integrating assessments into the ship's operations if the assessment is to be effective with minimal interference with those operations. The assessment procedures are offered here specifically as samples or illustrations of an assessment process. They should be modified and adapted for use by any other company or ship if it is determined that these procedures do not satisfy company policy or the ship's bridge operations.

A major concern in the preparation of the assessment procedures was the establishment of a standard of performance to be expected, i.e., what is a passing grade? Did a candidate need to pass 100% of the items to be considered proficient in the task, or would an alternative standard be acceptable? For example, in a training environment, it may well be acceptable to pass the majority of the items and receive a passing grade on the entire assessment for the purpose of obtaining a course grade. However, it was deemed that professional mariners onboard ship should be expected to properly execute all of the steps of a procedure, particularly those for starting up and securing a system or specific equipment, to be considered proficient in the task. Thus, if any single item is not passed, the candidate will not be given credit for the assessment and must repeat the demonstration at a later date.

This sample assessment is for illustrative purposes only. It is NOT intended as the standard for general industry use, and is not to be interpreted as U. S. Coast Guard policy.

This report may be downloaded from the U.S. Coast Guard Research and Development Center web site at <http://www.rdc.uscg.mil>.

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ASSESSOR INSTRUCTIONS

Introduction

The following procedures are designed to assess a candidate's ability to perform helmsman duties. The assessment includes demonstrating knowledge of how to use all steering and compass equipment; performing steering procedures in open waters; and performing steering procedures in shallow water while maneuvering. It also includes demonstration of steering by visual range or landmark.

The assessment materials include *Assessor Instructions*, *Candidate Instructions*, an *Assessment Control Sheet*, and four separate assessment modules (*Assessment Worksheets I-IV*). The *Assessor Instructions* describe the assessment objectives, method, conditions, measures, and standards. The *Assessor Instructions* also list the responsibilities of the assessor during each phase of the assessment process in an *Assessment Checklist*. The *Candidate Instructions* explain the assessment process from the candidate's perspective and define the responsibilities of the candidate.

The *Assessment Control Sheet* provides a record of the assessment. It includes the names of the candidate and assessor, the date and location of the assessment, and the STCW reference information for the competence area being assessed. Section 3 of the *Assessment Control Sheet* provides space for the assessor to record the assessment results for each worksheet. Finally, Section 4 of the control sheet summarizes the actions to be assessed, as they correspond to each assessment worksheet and objective.

As the assessor, you will evaluate the candidate's ability to meet the performance standards specified for each action in the assessment worksheets. Using the scoring procedures for each worksheet, you will provide the candidate with a separate score and pass/fail result for each worksheet and compile these results for the entire assessment on the *Assessment Control Sheet*.

The rest of this section briefly describes the various components of this assessment. *Assessment Worksheets I* through *IV* provide additional information about the assessment objectives, method, conditions, performance measures, and performance standards.

Assessment Objectives

During this assessment, the candidate should demonstrate the following abilities:

1. Demonstrate the use of steering equipment.
2. Demonstrate knowledge of proper steering procedures.
3. Demonstrate the use of magnetic and gyro compasses in open water and moderate weather.
4. Demonstrate understanding and execution of helm orders in open water and moderate weather.
5. Demonstrate understanding and execution of helm orders in open water and heavy weather.

6. Demonstrate the use of magnetic and gyro compasses in confined waters.
7. Demonstrate understanding and execution of helm orders in confined waters.

Assessment Method

This assessment is conducted using two methods. First, the candidate is asked to answer a series of questions while at the helm station when he/she is not responsible for steering. If the candidate passes this portion of the assessment, a series of three practical demonstrations of the performance of their duties is next conducted at the helm while the vessel is underway.

Assessment Conditions

The assessment should occur at an approved steering station that is fitted with manual and automatic helm modes, gyro repeater, and magnetic compass. Optimally, the steering system should have manual and automatic pilot, non-follow-up unit, navigation modes with adjustable controls, rate of turn indicator, and steering alarms. Three different conditions are required for the practical demonstrations: open waters in moderate sea conditions, open waters in heavy weather, and confined waters. These practical assessments will be conducted over several watches, but every attempt should be made to complete the assessment in as short a period as reasonable, given watch assignments and available conditions.

Performance Measures and Standards

Each assessment objective is comprised of one or more actions. Each action has one or more corresponding performance measure(s) and standard(s). For example, Assessment Objective 1 is comprised of 16 separate actions (see Section 2 of *Assessment Worksheet I* on pages 11 through 15).

Assessment Checklist

The following checklist summarizes the tasks and responsibilities of the assessor at each phase of the assessment process.

Preparing for the Steering Assessment

- ☐ Gather steering assessment materials.
- ☐ Ensure that the bridge and helm are available for use in assessment.
- ☐ Review the *Assessment Control Sheet*, *Assessment Worksheets*, and *Candidate Instructions*.
- ☐ Ensure that the appropriate conditions are present for the assessment being conducted and that the vessel is clear of navigational hazards.
- ☐ Identify and observe necessary safety precautions.
- ☐ Schedule the assessment and inform all affected personnel.

Briefing the Candidate before the Assessment

- ❑ Provide the candidate with a copy of the Candidate Instructions and Assessment Control Sheet for this assessment.
- ❑ Review the helmsman assessment instructions with the candidate and answer any questions.
- ❑ Discuss the assessment objectives and explain any that require the use of non-standard procedures.
- ❑ Advise the candidate of the time constraints, including when the assessment will begin and under what circumstances the assessment will be terminated.
- ❑ Inform the candidate that he or she should use appropriate marine terminology during all phases of the assessment.
- ❑ Discuss the desired outcome(s) and consequences of failing to perform part or all of the helmsman assessment.
- ❑ Remind the candidate that it is permissible to ask questions during the assessment, especially if he or she has a safety concern.
- ❑ Inform the candidate that all phases of the assessment are to be conducted in English.
- ❑ Discuss the candidate's willingness to be assessed under the circumstances presented.

Observing the Candidate's Performance

- ❑ If a safety violation occurs, terminate the assessment immediately.
- ❑ Continuously observe the candidate during the assessment. Require that standard procedures or company policy be adhered to, except when assessment procedures require demonstration of knowledge or skill different from a convention adopted by the company.
- ❑ Ensure realistic assessment conditions consistent with a normal working environment for the helmsman. Ensure that the candidate can concentrate on the task at hand. Do not allow other crewmembers to interfere with the assessment. Do not allow the candidate to "learn the test" by observing the performance of other assessment candidates.
- ❑ Avoid asking leading questions. Try to keep your questions fair but general in nature.
- ❑ Avoid giving the candidate unsolicited assistance, but respond to appropriate questions and provide appropriate equipment when required.
- ❑ Remain objective and maintain positive control of the assessment process at all times.

Recording Results and Determining Assessment Outcome

- ❑ Record performance on the appropriate *Assessment Worksheet*.
- ❑ The performance standards specified on each *Assessment Worksheet* should be strictly followed.

- ❑ Determine and document the outcome for each *Assessment Worksheet*, then transfer the final results to the *Assessment Control Sheet*.

Debriefing the Candidate

- ❑ Debrief the candidate as soon as possible after the assessment.
- ❑ Restate the assessment objectives.
- ❑ Focus on positive accomplishments first.
- ❑ Identify the specific areas needing improvement.
- ❑ If the candidate failed to demonstrate proficiency, jointly develop an improvement plan to prepare for reassessment.

Assessor Comments

The *Assessor Comments* page is provided for assessors to record their observations and comments regarding assessment conditions or limitations that may have affected the validity or reliability of the assessment outcome.

Reassessment Procedure

The candidate may request reassessment, which may be conducted no sooner than 48 hours after the final debriefing. Reassessment can be limited to those worksheets that were not previously passed. However, a score of 100% is required on all worksheets used in reassessment.

CANDIDATE INSTRUCTIONS

In this assessment, you will be evaluated on your ability to perform helmsman duties. Table A-1 shows the 1995 *STCW Code* specification for the performance of helmsman duties.

Table A-1. *STCW Code* - Specification for the performance of helmsman duties.

STCW Requirement	1995 <i>STCW Code</i> , Section A-II/4 (p. 68): Mandatory minimum requirements for certification of ratings forming part of a navigational watch.
STCW Function	Navigation at the support level.
STCW Competence	Steer the ship and comply with helm orders also in the English language.
STCW Proficiency	Performance of helmsman duties.

Assessment Objectives and Methods

A qualified assessor will assess you on your ability to meet the seven assessment objectives in the first column of Table A-2. The first two objectives will be assessed on the basis of your answers, explanations, and demonstrations in response to assessor questions. This part of the assessment **will not** be conducted while you are standing watch at the helm. The remaining five objectives will be assessed on the basis of observation of your performance at the helm during your normal duties.

Table A-2. Assessment objectives and methods for helmsman duties.

Assessment Objective	Assessment Method
1. Demonstrate use of steering equipment.	Answers, explanations, and demonstrations in response to assessor questions.
2. Demonstrate knowledge of proper steering procedures.	
3. Demonstrate the use of magnetic and gyro compasses in open water and moderate weather.	Practical demonstration at the helm during normal duties.
4. Demonstrate understanding and execution of helm orders in open water and moderate weather.	
5. Demonstrate the ability to steer by gyrocompass in open water and heavy weather.	
6. Demonstrate the use of the magnetic and gyro compasses in confined waters.	
7. Demonstrate understanding and execution of helm orders in confined waters.	

Below are some general guidelines for what you should expect during the assessment process.

Pre-Assessment Briefing with Assessor

This briefing should occur a minimum of one day before the scheduled assessment. This will help you and the assessor to be well prepared for the assessment when it actually occurs. During this briefing, you should:

- Discuss your prior experience, training, and/or company policy with the assessor. On the basis of these qualifications, discuss whether you are qualified to undertake the helmsman assessment. If you both agree you are qualified, then continue with the assessment process. If not, arrange for additional training, and set a date for another review of your qualifications.
- Review the helmsman assessment objectives and methods (Table A-2), and ask any questions you have about them.
- Discuss the desired outcome(s) and the consequences of failing to perform any part of the helmsman assessment.
- Discuss the general helmsman assessment procedures. Your assessor will inform you of how much time is allowed, when the assessment begins, and under what circumstances he or she will terminate the assessment.
- Consider whether you are willing to be assessed under the circumstances presented and advise the assessor of your willingness to undertake the assessment.

Participation in the Assessment

You are expected to adhere to standard procedures or company policy unless the assessor briefs you on a requirement to perform a non-standard procedure. During the assessment, remember to:

- Use appropriate marine terminology at all times.
- Listen to an entire question before responding or acting. Remember that you may not use reference material of any kind during the assessment examination.
- Ask questions if you have a safety concern. If a safety violation occurs, the assessor will terminate the assessment immediately.

To the extent practical, the assessor will ensure that your assessment is conducted under normal working conditions.

The Outcome of Your Assessment

The assessor will record your performance on a series of *Assessment Worksheets*. The assessor will score each performance measure on a "Pass/Fail" basis. Acceptable performance (a "Pass" score) will be based on your demonstrated ability to correctly respond to the questions that you are asked during the examination portions of the assessment. It will also be based on your ability to safely perform assigned tasks in a manner that demonstrates that you possess the required level of skill, knowledge, and ability, as well as sound and professional judgment.

If you receive a "Fail" score on a worksheet, or if you "Fail" any of the required performance standards, your assessment will be suspended and postponed until you receive further instruction and training.

Note that the following events will terminate an assessment immediately:

- An action, or lack of action, by you which required corrective action or intervention by the assessor to prevent injury, damage, or the development of a hazardous condition.
- Your failure to use proper procedures, including appropriate communication procedures, during the assessment.
- Your failure to take prompt corrective action when required.

The assessor will strictly adhere to pre-determined performance standards and scoring procedures and will document the outcome of the assessment on the *Assessment Control Sheet*.

Assessment Debriefing

The assessor should discuss the assessment results with you as soon as possible after the assessment. During the debriefing:

- The assessor should restate the assessment objective(s) and identify those that you successfully demonstrated.
- If applicable, you and the assessor should discuss the areas in which you need improvement, and then develop an improvement plan based on the helmsman assessment outcome.

ASSESSMENT CONTROL SHEET

Section 1. Assessment Reference Information

1. Name of Candidate	2. Name of Designated Assessor
3. Date of Assessment	4. Vessel Name and Location
5. Vessel Standing Orders • Vessel standing orders state that comparison of gyro and magnetic compasses shall take place every _____ minutes at sea. • Vessel standing orders/procedures state the following action should be taken by helmsman in event of steering failure alarm _____. • Other company or vessel specific procedures affecting assessment.	

Section 2. STCW Reference Information

Assessment Area	Performance of helmsman duties.
Assessment Method	Shipboard assessment.
STCW Requirement	STCW Code, Section A-II/4, p. 68 – Mandatory minimum requirements for certification of ratings forming part of a navigational watch.
STCW Function	Navigation at the support level.
STCW Competence	Steer the ship and comply with helm orders also in the English language.
STCW Proficiency	Performance of helmsman duties.

Section 3. Assessment Objectives, Methods, and Scores

Worksheet	Assessment Objective	Assessment Methods	Score
I	1. Demonstrate use of steering equipment.	Answers, explanations, and demonstrations at the helm in response to assessor questions.	☐ Pass
	2. Demonstrate knowledge of proper steering procedures.		☐ Fail
II	3. Demonstrate the use of magnetic and gyro compasses on open water.	Practical demonstration at the helm during normal duties.	☐ Pass
	4. Demonstrate understanding and execution of helm orders in open water and moderate weather.		☐ Fail
III	5. Demonstrate understanding and execution of helm orders in open water and heavy weather.	Practical demonstration at the helm during normal duties.	☐ Pass ☐ Fail
IV	6. Demonstrate the use of the magnetic and gyro compasses in confined waters.	Practical demonstration at the helm during normal duties.	☐ Pass
	7. Demonstrate understanding and execution of helm orders in confined waters.		☐ Fail
NOTE: Successful performance on the entire assessment requires a passing score on all worksheets.		Overall Assessment Result	☐ Pass ☐ Fail

Section 4. Assessment Worksheet Summary

Assessment Worksheet	Assessment Objective	Action
I	1. Demonstrate the use of steering equipment.	1.1 Use and adjustment of steering controls. 1.2 Use of the steering compass. 1.3 Use of the rudder angle and rudder order indicator. 1.4 Use of the rate of turn indicator. 1.5 Use of steering system alarms. 1.6 Use and adjustment of the course recorder. 1.7 Demonstrate location of steering pump controls. 1.8 Demonstrate location of steering motor controls. 1.9 Demonstrate how to engage or disengage the autopilot. 1.10 Demonstrate how to engage or disengage the non-follow-up unit.
	2. Demonstrate knowledge of proper steering procedures.	2.1 Demonstrate knowledge of helmsman watch relief procedure – reporting. 2.2 Demonstrate knowledge of helmsman watch relief procedure – rudder position. 2.3 Understand procedure for relieving the wheel during a maneuver. 2.4 Understand procedure for conflicting helm orders. 2.5 Understand procedure for reporting a steering failure. 2.6 Understand the possible causes of a steering failure.
II	3. Demonstrate the use of magnetic and gyro compasses in open waters and moderate weather.	3.1 Compare and report course by gyro and magnetic compass after a course change. 3.2 Compare and report course by gyro and magnetic compass periodically. 3.3 Report course by gyro and magnetic compass to the watch officer when changes in compared headings are noted. 3.4 Steer by gyrocompass in moderate weather. 3.5 Steer by magnetic compass in moderate weather.
	4. Demonstrate understanding and execution of helm orders in open waters and moderate weather.	4.1 Repeat helm command as given. 4.2 Execute course change. 4.3 Demonstrate how to hand over the helm in open water.
III	5. Demonstrate the ability to steer by gyrocompass in heavy weather.	5.1 Steer by gyrocompass in heavy weather.

Section 4. Assessment Worksheet Summary (Continued)

Assessment Worksheet	Assessment Objective	Action
IV	6. Demonstrate the use of magnetic compasses in confined waters.	6.1 Compare and report course by gyro and magnetic compass after a course change.
		6.2 Compare and report course by gyro and magnetic compass periodically.
	7. Demonstrate understanding and execution of helm orders in confined waters.	7.1 Repeat helm command as given.
		7.2 Execute course changes.
		7.3 Steer by gyrocompass in moderate weather.
		7.4 Steer by visual range or landmark.
		7.5 Demonstrate how to hand over the helm in confined waters.

ASSESSMENT WORKSHEET I

Section 1. Assessment Conditions

Assessment Objectives	1. Demonstrate the use of steering equipment. 2. Demonstrate knowledge of proper steering procedures.
Assessment Method	Answers, explanations, and demonstrations in response to assessor questions.
Candidate Orientation	Assessor briefs the candidate on assessment methods, conditions, and standards.
Required Equipment, Apparatus, and/or Tools	The candidate should be stationed at an approved steering station fitted with manual and automatic helm modes, gyro repeater, and magnetic compass. Optimally, the steering system should have manual and automatic pilot, non-follow-up unit, rate of turn indicator, and steering alarms.
Initial Condition	This assessment should take place on the bridge while the vessel is not in confined waters or not underway. A steering failure drill may be simulated for purpose of this assessment. Standing orders or company policy must be strictly adhered to during all phases of the assessment.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Action*, *Performance Measure*, or *Performance Standard* was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
1.1 Use and adjustment of steering controls.	Answers question: <i>Identify and demonstrate the use of all primary steering controls and adjustments.</i>	Correctly answers both questions: Correctly locates and identifies steering controls, wheel, levers, and non-follow-up control and/or indicator. And Correctly explains the operation of the steering controls in accordance with standing orders and manufacturer instructions.	☐ Pass ☐ Fail
1.2 Use of the steering compass.	Answers question: <i>Identify and demonstrate accurate readings from the gyro and magnetic steering compasses.</i>	Correctly answers both questions: Correctly locates and identifies gyro and magnetic steering compasses. And Accurately reads all compasses to within .5 degree accuracy following the digital repeater convention of the manufacturer.	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
1.3 Use of the rudder angle and rudder order indicator.	Answer questions: <i>Locate and identify rudder angle and rudder order indicators.</i> <i>Describe the function of each indicator.</i>	Correctly answers both questions: Correctly identifies the rudder angle and order indicators. And Correctly describes the rudder angle indicator (it indicates what the rudder is actually doing) and the function of the rudder order indicator (it indicates the order that is sent to the steering system).	☐ Pass ☐ Fail ☐ N/A
1.4 Use of the rate of turn indicator.	Answers questions: <i>Locate and identify the rate of turn indicator.</i> <i>Describe the rate of turn function.</i>	Correctly answers both questions: Correctly identifies the rate of turn indicator. AND Correctly describe how to determine direction and rate of turn (units).	☐ Pass ☐ Fail ☐ N/A
1.5 Use of steering system alarms.	Answers questions: <i>Locate and identify the steering system alarms.</i> <i>Describe the steering system alarms.</i> <i>Describe the actions to be taken in the event of a steering alarm.</i>	Correctly answers all three questions: Correctly identifies steering system alarms. And Correctly describes alarms as audible and flashing or steady light. And Correctly describes actions taken in event of alarm that are consistent with ship/company procedures.	☐ Pass ☐ Fail ☐ N/A
1.6 Use and adjustment of the course recorder.	Answers questions: <i>Locate and identify the course recorder.</i> <i>Demonstrate how to read the course recorder.</i> <i>Describe how to verify time and course accuracy with the master gyro.</i>	Correctly answers all three questions: Correctly identifies the course recorder. And Correctly demonstrates how to read the course recorder. And Verifies time and course within 2 degrees and 2 minutes time.	☐ Pass ☐ Fail ☐ N/A

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
1.7 Demonstrate location of steering pump controls.	Answers questions: <i>Locate the steering pump controls.</i> <i>Identify the steering pump currently in use.</i> <i>Explain the steering pump change over procedure and responsibilities.</i>	Correctly answers all three questions: Correctly identifies the steering pump controls. And Correctly identifies the steering pump in use based on control switch position. And Explains the change over procedure responsibilities consistent with standing orders, company policy, and manufacturer instructions.	☐ Pass ☐ Fail ☐ N/A
1.8 Demonstrate location of steering motor controls.	Answers questions: <i>Locate the steering motor controller.</i> <i>Identify the motor currently in use.</i> <i>Explain the steering motor controller change over procedures and responsibilities.</i>	Correctly answers all three questions: Correctly identifies the steering motor controller. And Correctly identifies the steering motor currently in use. And Explains the change over procedure responsibilities consistent with standing orders, company policy, and manufacturer instructions.	☐ Pass ☐ Fail ☐ N/A
1.9 Demonstrate how to engage or disengage autopilot.	Answers questions: <i>Is the autopilot currently engaged or disengaged?</i> <i>Demonstrate how to engage and disengage the autopilot.</i>	Correctly answers both questions: Correctly reports the mode of the autopilot. And Correctly demonstrates how to engage or disengage the autopilot consistent with company procedures and manufacturer instructions.	☐ Pass ☐ Fail ☐ N/A
1.10 Demonstrate how to engage or disengage the non-follow-up (NFU) unit.	Answers questions: <i>How do you determine if the non-follow-up unit is in use?</i> <i>Is the NFU currently in use?</i> <i>Demonstrate how to engage/disengage the NFU.</i>	Correctly answers all three questions: Correctly explains how to determine if the non-follow-up unit is in use. And Correctly identifies whether the NFU is currently in use. And Correctly demonstrates how to engage or disengage NFU consistent with company procedures and manufacturer instructions.	☐ Pass ☐ Fail ☐ N/A

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
2.1 Demonstrate knowledge of helmsman watch relief procedure – reporting.	Answers questions: <i>What should you report when handing over the helm to your relief?</i> <i>To whom should you report after being relieved?</i>	Correctly answers both questions: Identifies all of the following items to be reported when handing over the helm: ☐ The mode of operation (hand, autopilot, non-follow-up unit). ☐ Vessel's heading. ☐ Gyro course. ☐ Magnetic compass course. ☐ The amount of helm carried to maintain a steady course, when appropriate. ☐ Conning officer if more than one officer is on the bridge. And Correctly indicates that the helmsman who has been relieved should report course to the officer of the navigational watch after being relieved.	☐ Pass ☐ Fail
2.2 Demonstrate knowledge of helmsman watch relief procedure – rudder position.	Answers question: <i>What position should the rudder be in when the helm is relieved?</i>	Correctly answers that the helm should be relieved with no rudder ordered.	☐ Pass ☐ Fail
2.3 Understand procedure for relieving the wheel during a maneuver.	Answers questions: <i>Under what circumstances should the wheel be relieved during a maneuver?</i>	Correct response is <i>never</i> . Under no circumstances should the wheel be relieved during a maneuver.	☐ Pass ☐ Fail
2.4 Understand procedure for conflicting helm orders.	Answers question: <i>What should you do when you receive conflicting helm commands?</i>	States that the master's orders are to be obeyed whenever there is conflict between pilots and members of the bridge team.	☐ Pass ☐ Fail
2.5 Understand procedure for reporting a steering failure.	Answers question: <i>How do you report a steering failure?</i>	Helmsman describes procedure for reporting steering failure to the officer of the navigational watch consistent with ship standing orders and company procedure.	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
2.6 Understand the possible causes of a steering failure.	Answers question: <i>Describe some of the possible causes of steering failures.</i>	Identify at least 4 of the following: ☐ Loss of electrical power. ☐ Loss of hydraulic power. ☐ Loss of hydraulic fluid. ☐ Failure of rudder angle indicator. ☐ Failure of steering stand mechanical linkage. ☐ Failure of mechanical linkage in the steering gear space. ☐ Failure of the steering motor. ☐ Failure of electrical breaker. ☐ Mechanical damage to rudder, rudderpost, etc. ☐ Failure of connection from bridge to steering gear room.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet I Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSMENT WORKSHEET II

Section 1. Assessment Conditions

Assessment Objectives	3. Demonstrate the use of magnetic and gyrocompasses in open waters. 4. Demonstrate understanding and execution of helm orders in open waters at sea speed (water depth = 6 times draft or more).
Assessment Method	Practical shipboard demonstration by the candidate.
Candidate Orientation	Assessor briefs the candidate on assessment methods, conditions, and standards.
Required Equipment, Apparatus, and/or Tools	The candidate should be stationed at an approved steering station fitted with manual and automatic helm modes, gyro repeater, and magnetic compass. Optimally, the steering system should have manual and automatic pilot, non-follow-up unit, rate of turn indicator, and steering alarms.
Initial Condition	This assessment should occur in open waters at full speed. Weather conditions to be less than force 5. The assessor will observe and monitor the candidate's performance at the helm during the course of a normal watch.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE:	Every row corresponding to an <i>Action</i> , <i>Performance Measure</i> , and <i>Performance Standard</i> in the following table should have one <i>Score</i> checked at the completion of the assessment.
Pass	Indicates that the <i>Performance Standard</i> was met.
Fail	Indicates that the <i>Performance Standard</i> was not met.
N/A	Indicates that the <i>Action</i> , <i>Performance Measure</i> , or <i>Performance Standard</i> was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
3.1 Compare and report course by gyro and magnetic compass after a course change.	Report of compass comparison.	Performance meets all standards: ☐ Correct report after course change. Reading to be taken on (or corrected for) ordered course. ☐ Reported magnetic reading to be +/- 2 degrees of actual.	☐ Pass ☐ Fail ☐ N/A
3.2 Compare and report course by gyro and magnetic compass periodically.	Report of compass comparison.	Performance meets all standards: ☐ Correct report at the time interval specified in the standing orders or company policy. ☐ Comparison of gyro and magnetic compass to be unprompted by assessor/watch officer if consistent with company procedures. ☐ Reported magnetic reading to be +/- 2 degrees of actual.	☐ Pass ☐ Fail ☐ N/A

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
3.3 Report course by gyro and magnetic compass to the watch officer when changes in compared headings are noted.	Report of compass comparison.	Performance meets all standards: ☐ Correct report when changes in compared headings are noted. ☐ Comparison of gyro and magnetic compass to be unprompted by assessor/watch officer if consistent with company procedures.	☐ Pass ☐ Fail ☐ N/A
3.4 Steer by gyro compass in moderate weather.	Maintain a steady course.	Course to be maintained at +/- 2 degrees of ordered course for 30 minutes, relying solely upon the gyrocompass. In adverse winds or current, allowance can be made for a less stringent standard.	☐ Pass ☐ Fail ☐ N/A
3.5 Steer by magnetic compass in moderate weather.	Maintain a steady course.	Course to be maintained at +/- 5 degrees of ordered course for 30 minutes, relying solely upon the magnetic compass. In adverse winds or current, allowance can be made for a less stringent standard.	☐ Pass ☐ Fail ☐ N/A
4.1 Repeat helm command as given.	Repetition of steering order.	Performance meets all standards: ☐ Repeats helm command word-for-word using standard terminology. ☐ Cadence and terminology is in compliance with standing orders or company policy.	☐ Pass ☐ Fail ☐ N/A
4.2 Execute course change.	Execution of course change.	Performance meets all standards: ☐ Applies appropriate amount of rudder to actuate controllable turn rate. ☐ Checks swing and applies counter rudder as necessary. ☐ Steadies up on ordered course. ☐ For course changes of less than 20 degrees, overswing to be less than 2 degrees. ☐ For course changes of greater than 20 degrees, overswing to be less than 10% of ordered heading rounded up to the next full degree.	☐ Pass ☐ Fail ☐ N/A

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
4.3 Demonstrate how to hand over the helm in open water.	Provide proper reports when relieved.	Performance meets all of the following standards: All of the following are reported to the relief at the time of hand over: ☐ The mode of operation [hand, autopilot, non-follow-up unit (NFU)]. ☐ Vessel's heading. ☐ Gyro course. ☐ Magnetic compass course. ☐ The amount of helm carried to maintain a steady course, when appropriate. ☐ Who is the conning officer if more than one officer is on the bridge? And Helmsman who has been relieved should report course to the officer of the navigational watch after being relieved.	☐ Pass ☐ Fail ☐ N/A

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet II Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total. Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i>. Transfer the final Worksheet II Pass/Fail score to the <i>Assessment Control Sheet</i>.		☐ Pass ☐ Fail

ASSESSMENT WORKSHEET III

Section 1. Assessment Conditions

Assessment Objectives	5. Demonstrate the ability to steer by gyrocompass in heavy weather.
Assessment Method	Practical shipboard demonstration.
Candidate Orientation	Assessor briefs the candidate on assessment methods, conditions, and standards.
Required Equipment, Apparatus, and/or Tools	The candidate should be stationed at an approved steering station fitted with manual and automatic helm modes, gyro repeater, and magnetic compass. Optimally, the steering system should have manual and automatic pilot, non-follow-up unit, rate of turn indicator, and steering alarms.
Initial Condition	This assessment should occur in open waters at sea in heavy weather. Weather conditions to be greater than force 6. The assessor will observe and monitor the candidate's performance at the helm during the course of a normal watch.

Section 2. Actions, Performance Measures, Standards, and Scores

Action	Performance Measure	Performance Standard	Score
5. Steer by gyrocompass in heavy weather.	Maintain a steady course.	Maintain ordered course for 30 minutes within 3 degrees, plus one additional degree for each level of wind force in Beaufort. For example, in wind force 7 course must be maintained +/- 10 degrees of ordered heading. In severe winds or current, allowance can be made for a less stringent standard.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Determine Worksheet III Pass/Fail status: Pass or failure is based upon the score obtained for the single Performance Measure and Performance Standard for the above action. Transfer the final Worksheet III Pass/Fail score to the <i>Assessment Control Sheet</i> .	☐ Pass ☐ Fail
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ASSESSMENT WORKSHEET IV

Section 1. Assessment Conditions

Assessment Objectives	6. Demonstrate the use of magnetic and gyrocompasses in confined waters. 7. Demonstrate understanding and execution of helm orders in confined waters.
Assessment Method	Shipboard assessment and/or ship bridge simulator assessment.
Candidate Orientation	Assessor briefs the candidate on assessment methods, conditions, and standards.
Required Equipment, Apparatus, and/or Tools	The candidate should be stationed at an approved steering station fitted with manual and automatic helm modes, gyro repeater, and magnetic compass. Optimally, the steering system should have manual and automatic pilot, non-follow-up unit, rate of turn indicator, and steering alarms.
Initial Condition	This assessment should occur in confined waters at various maneuvering speeds. Weather conditions to be less than force 5. The assessor will observe and monitor the candidate's performance at the helm during the course of a normal watch.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Action*, *Performance Measure*, or *Performance Standard* was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
6.1 Compare and report course by gyro and magnetic compass after a course change.	Report of compass comparison.	Performance meets all standards: ☐ Correct report after course change. Reading to be taken on (or corrected for) ordered course. ☐ Reported magnetic reading to be +/- 2 degrees of actual.	☐ Pass ☐ Fail ☐ N/A
6.2 Compare and report course by gyro and magnetic compass periodically.	Report of compass comparison.	Performance meets all standards: ☐ Correct report at the time interval specified in the standing orders or company policy. ☐ Comparison of gyro and magnetic compass to be unprompted by assessor/watch officer if consistent with company procedures. ☐ Reported magnetic reading to be +/- 2 degrees of actual.	☐ Pass ☐ Fail ☐ N/A

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
7.1 Repeat helm command as given.	Repetition of steering order.	Performance meets all standards: ☐ Repeats helm command word-for-word using standard terminology. ☐ Cadence and terminology is in compliance with standing orders or company policy.	☐ Pass ☐ Fail ☐ N/A
7.2 Execute course changes.	Execution of a minimum of five course changes during one watch.	Performance meets all standards: ☐ Applies appropriate amount of rudder to actuate controllable turn rate. ☐ Checks swing and applies counter rudder as necessary. ☐ Steadies up on ordered course. ☐ For course changes of less than 20 degrees, overswing to be less than 2 degrees. ☐ For course changes of greater than 20 degrees, overswing to be less than 10% of ordered heading rounded up to the next full degree.	☐ Pass ☐ Fail ☐ N/A
7.3 Steer by gyrocompass in moderate weather.	Maintain a steady course.	Course to be maintained for 30 minutes +/- 2 degrees of ordered course. In adverse winds or current, allowance can be made for existing environmental conditions.	☐ Pass ☐ Fail ☐ N/A
7.4 Steer by visual range or landmark.	Ensure that heading is maintained.	Performance meets all standards: ☐ Landmark correctly identified. ☐ Rudder applied to correct side. ☐ If steering by range, forward and after range are maintained in a vertical line. ☐ Reference gyrocompass if steering by landmark.	☐ Pass ☐ Fail ☐ N/A

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

7.5 Demonstrate how to hand over the helm in confined waters.	Provide proper reports when being relieved.	Reports on all of the following that are applicable: ☐ The mode of operation (hand, autopilot, non-follow-up unit). • Vessel's heading: • Gyro course. ☐ Magnetic compass course. ☐ The amount of helm carried to maintain a steady course, when appropriate. ☐ Indicates who is the conning officer if more than one officer is on the bridge. ☐ Helmsman who has been relieved should report the above information to the officer of the navigational watch after being relieved.	☐ Pass ☐ Fail
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Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet IV Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet IV Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSOR COMMENTS

This page is provided for assessors to record their observations and comments regarding assessment conditions or limitations that may have affected the validity or reliability of the assessment outcome.

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APPENDIX B

MARINER ASSESSMENT PROCEDURES FOR THE PERFORMANCE OF LOOKOUT DUTIES

Blanchard, R. T., Hempstead, S. C., Murphy, J., and McCallum, M. C.

This appendix provides procedures used during the shipboard assessment trials performed by SeaRiver Maritime, Incorporated (SRM), with the assistance of the U.S. Coast Guard Research and Development Center. The procedures in this appendix were used in the trial assessment to assess a mariner's ability to act as Lookout. Included are assessor instructions, candidate instructions, four assessment worksheets, and an assessment control sheet for documenting the final results of the assessment.

SRM senior deck officers made minor revisions to a pre-existing assessment to be compatible with their company's procedures and the ships' bridge operations, and had the new assessment procedures verified by colleagues. During the earliest trials, they made additional revisions to increase the detail and objectivity of the measures in order to facilitate assessment by regular officers standing regular watches. A more detailed discussion of their adaptation appears in Chapter 1, subsection *Adapting and Preparing Procedures for Use in Onboard Assessments*. The remainder of Chapter 1 contains numerous references to the importance of integrating assessments into the ship's operations if the assessment is to be effective with minimal interference with those operations. The assessment procedures are offered here specifically as samples or illustrations of an assessment process. They should be modified and adapted for use by any other company or ship if it is determined that these procedures do not satisfy company policy or the ship's bridge operations.

A major concern in the preparation of the assessment procedures was the establishment of a standard of performance to be expected, i.e., what is a passing grade? Did a candidate need to pass 100% of the items to be considered proficient in the task, or would an alternative standard be acceptable? For example, in a training environment, it may well be acceptable to pass the majority of the items and receive a passing grade on the entire assessment for the purpose of obtaining a course grade. However, it was deemed that professional mariners onboard ship should be expected to properly execute all of the steps of a procedure, particularly those for starting up and securing a system or specific equipment, to be considered proficient in the task. Thus, if any single item is not passed, the candidate will not be given credit for the assessment and must repeat the demonstration at a later date.

This sample assessment is for illustrative purposes only. It is NOT intended as the standard for general industry use, and is not to be interpreted as U. S. Coast Guard policy.

This report may be downloaded from the U.S. Coast Guard Research and Development Center web site at <http://www.rdc.uscg.mil>.

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ASSESSOR INSTRUCTIONS

Introduction

The following procedures are designed to assess a candidate's ability to perform lookout duties. The assessment includes demonstrating knowledge of lookout duties, responsibilities, and procedures; and making lookout reports in restricted visibility and in clear visibility during daylight and at night.

The assessment materials include *Assessor Instructions*, *Candidate Instructions*, an *Assessment Control Sheet*, and four separate assessment modules (*Assessment Worksheets I-IV*). The *Assessor Instructions* describe the assessment objectives, method, conditions, measures, and standards. The *Assessor Instructions* also list the responsibilities of the assessor during each phase of the assessment process in an *Assessment Checklist*. The *Candidate Instructions* explain the assessment process from the candidate's perspective and define the responsibilities of the candidate.

The *Assessment Control Sheet* provides a record of the assessment. It includes the names of the candidate and assessor, the date and location of the assessment, and the STCW reference information for the competence area being assessed. Section 3 of the *Assessment Control Sheet* provides space for the assessor to record the assessment results for each worksheet. Finally, Section 4 of the control sheet summarizes the actions to be assessed, as they correspond to each assessment worksheet and objective.

As the assessor, you will evaluate the candidate's ability to meet the performance standards specified for each action in the assessment worksheets. Using the scoring procedures for each worksheet, you will provide the candidate with a separate score and pass/fail result for each worksheet and compile these results for the entire assessment on the *Assessment Control Sheet*.

The rest of this section briefly describes the various components of this assessment. *Assessment Worksheets I* through *IV* provide additional information about the assessment objectives, method, conditions, performance measures, and performance standards.

Assessment Objectives

During this assessment, the candidate should demonstrate the following abilities:

1. Describe lookout duties and responsibilities.
2. Identify lookout stations and safe routes onboard.
3. Describe and identify the international distress signals.
4. Demonstrate lookout watch relief procedures.
5. Demonstrate the use of lookout equipment.
6. Demonstrate lookout techniques and make lookout reports in clear visibility during daylight.
7. Demonstrate lookout techniques and make lookout reports in clear visibility at night.

8. Demonstrate lookout techniques and make lookout reports in restricted visibility during daylight or at night.

Assessment Method

This assessment is conducted using two methods. First, the candidate is asked to answer a series of questions while at the lookout station or on the bridge when he/she is not responsible as a lookout on duty. If the candidate passes this portion of the assessment, a series of three practical demonstrations of the performance of their duties as lookout is next conducted while the vessel is underway.

Assessment Conditions

Candidates should be posted at a lookout station for the portion of the assessment that requires practical demonstration. At a minimum, the lookout station should be equipped with an internal communication system and binoculars. Other equipment at the lookout station that may be useful are a ship's bell and a bearing repeater fitted with a bearing/azimuth circle, alidade, or pelorus. The lookout station should be clear and the assessor must be able to observe activities.

The conditions for *Assessment Worksheets II, III, and IV* are as follows:

- II – Clear visibility during daylight.
- III – Clear visibility at night.
- IV – Restricted visibility during daylight or at night.

Performance Measures and Standards

Each assessment objective is comprised of one or more actions. Each action has one or more corresponding performance measures and standards. For example, Assessment Objective 1 is comprised of five different actions (see Section 2 of *Assessment Worksheet I* on pages 10 through 13).

Assessment Checklist

The following checklist summarizes the tasks and responsibilities of the assessor at each phase of the assessment process.

Preparing for the Lookout Assessment

- ☐ Gather lookout assessment materials.
- ☐ Prepare the assessment area(s), test facility, and/or lookout station.
- ☐ Review the *Assessment Control Sheet*, *Assessment Worksheets*, and *Candidate Instructions*.
- ☐ Ensure that the appropriate conditions are present for the assessment being conducted and that the vessel is clear of navigational hazards.
- ☐ Identify and observe necessary safety precautions.

- ❑ Schedule the assessment and inform all affected personnel.

Briefing the Candidate before the Assessment

- ❑ Provide the candidate with a copy of the *Candidate Instructions* and *Assessment Control Sheet* for this assessment.
- ❑ Review the lookout assessment instructions with the candidate and answer any questions.
- ❑ Discuss the assessment objectives and explain any that require the use of non-standard procedures.
- ❑ Advise the candidate of the time constraints, including when the assessment will begin and under what circumstances the assessment will be terminated.
- ❑ Inform the candidate that he or she should use appropriate marine terminology during all phases of the assessment.
- ❑ Discuss the desired outcome(s) and consequences of failing to perform part or all of the lookout assessment.
- ❑ Remind the candidate that it is permissible to ask questions during the assessment, especially if he or she has a safety concern.
- ❑ Inform the candidate that he or she must have vision correctable to at least 20/40 in each eye and uncorrected vision of at least 20/200 in each eye. His or her color sense must be determined to be satisfactory, without the use of color-sensing lenses.
- ❑ Inform the candidate that all phases of the assessment are to be conducted in English.
- ❑ Discuss the candidate's willingness to be assessed under the circumstances presented.

Observing the Candidate's Performance

- ❑ If a safety violation occurs, terminate the assessment immediately.
- ❑ Continuously observe the candidate during the assessment. Require that standard procedures or company policy be adhered to, except when assessment procedures require demonstration of knowledge or skill different from a convention adopted by the company (e.g., use of degrees to report sightings when points are the convention).
- ❑ Ensure realistic assessment conditions consistent with a normal working environment for the helmsman. Ensure that the candidate can concentrate on the task at hand. Do not allow other crewmembers to interfere with the assessment. Do not allow the candidate to "learn the test" by observing the performance of other assessment candidates.
- ❑ Avoid asking leading questions. Try to keep your questions fair but general in nature.
- ❑ Avoid giving the candidate unsolicited assistance but respond to appropriate questions and provide appropriate equipment when required.
- ❑ Remain objective and maintain positive control of the assessment process at all times.

Recording Results and Determining Assessment Outcome

- ☐ Record performance on the appropriate *Assessment Worksheet*.
- ☐ The performance standards specified on each *Assessment Worksheet* should be strictly followed.
- ☐ Determine and document the outcome for each *Assessment Worksheet*, then transfer the final results to the *Assessment Control Sheet*.

Debriefing the Candidate

- ☐ Debrief the candidate as soon as possible after the assessment.
- ☐ Restate the assessment objectives.
- ☐ Focus on positive accomplishments first.
- ☐ Identify the specific areas needing improvement.
- ☐ If the candidate failed to demonstrate proficiency, jointly develop an improvement plan to prepare for reassessment.

Assessor Comments

The *Assessor Comments* page is provided for assessors to record their observations and comments regarding assessment conditions or limitations that may have affected the validity or reliability of the assessment outcome.

Reassessment Procedure

The candidate may request reassessment, which may be conducted no sooner than 48 hours after the final debriefing. Reassessment can be limited to those worksheets that were not previously passed. However, a score of 100% is required on all worksheets used in reassessment.

CANDIDATE INSTRUCTIONS

In this assessment, you will be evaluated on your ability to perform lookout duties. Table B-1 shows the 1995 *STCW Code* specification for the performance of lookout duties.

Table B-1. *STCW Code* - Specification for the performance of lookout duties.

STCW Requirement	1995 <i>STCW Code</i> , Section A-II/4 (p. 68): Mandatory minimum requirements for certification of ratings forming part of a navigational watch.
STCW Function	Navigation at the support level.
STCW Competence	Keep a proper lookout by sight and hearing.
STCW Proficiency	Responsibilities of a lookout, including reporting the approximate bearing of a sound signal, light, or other object in degrees or points.

Assessment Objectives and Methods

A qualified assessor will assess you on your ability to meet the eight assessment objectives in the first column of Table B-2. The first five objectives will be assessed on the basis of your answers, explanations, and demonstrations in response to assessor questions. This part of the assessment **will not** be conducted while you are standing watch at a lookout station. The remaining three objectives will be assessed on the basis of observation of your performance at the lookout station during your normal duties.

Table B-2. Assessment objectives for lookout duties.

Assessment Objective	Assessment Type
1. Describe lookout duties and responsibilities.	Answers, explanations, and demonstrations in response to assessor questions.
2. Identify lookout stations and safe routes onboard.	
3. Describe and identify the international distress signals.	
4. Demonstrate lookout watch relief procedures.	
5. Demonstrate the use of lookout equipment.	
6. Demonstrate lookout techniques and make lookout reports in clear visibility during daylight.	Practical demonstration at lookout station during normal duty.
7. Demonstrate lookout techniques and make lookout reports in clear visibility at night.	
8. Demonstrate lookout techniques and make lookout reports in restricted visibility during daylight or at night.	

Below are some general guidelines for what you should expect during the assessment process.

Pre-Assessment Briefing with Assessor

This briefing should occur a minimum of one day before the scheduled assessment. This will help you and the assessor to be well prepared for the assessment when it actually occurs. During this briefing, you should:

- Discuss your prior experience, training, and/or company policy with the assessor. On the basis of these qualifications, discuss whether you are qualified to undertake the lookout assessment. If you both agree you are qualified, then continue with the assessment process. If not, arrange for additional training, and set a date for another review of your qualifications.
- Review the lookout assessment objectives and methods (Table B-2), and ask any questions you have about them.
- Discuss the desired outcome(s) and the consequences of failing to perform any part of the lookout assessment.
- Discuss the general lookout assessment procedures. Your assessor will inform you of how much time is allowed, when the assessment begins, and under what circumstances he or she will terminate the assessment.
- Consider whether you are willing to be assessed under the circumstances presented and advise the assessor of your willingness to undertake the assessment.

Participation in the Assessment

You are expected to adhere to standard procedures or company policy unless the assessor briefs you on a requirement to perform a non-standard procedure. During the assessment, remember to:

- Use appropriate marine terminology at all times.
- Listen to an entire question before responding or acting. Remember that you may not use reference material of any kind during the assessment examination.
- Ask questions if you have a safety concern. If a safety violation occurs, the assessor will terminate the assessment immediately.

To the extent practical, the assessor will ensure that your assessment is conducted under normal working conditions.

The Outcome of Your Assessment

The assessor will record your performance on a series of *Assessment Worksheets*. The assessor will score each performance measure on a "Pass/Fail" basis. Acceptable performance (a "Pass" score) will be based on your demonstrated ability to correctly respond to the questions that you are asked during the examination portions of the assessment. It will also be based on your ability to safely perform assigned tasks in a manner that demonstrates that you possess the required level of skill, knowledge, and ability, as well as sound and professional judgment.

If you receive a "Fail" score on a worksheet, or if you "Fail" any of the required performance standards, your assessment will be suspended and postponed until you receive further instruction and training.

Note that the following events will terminate an assessment immediately:

- An action, or lack of action, by you that required corrective action or intervention by the assessor to prevent injury, damage, or the development of a hazardous condition.

- Your failure to use proper procedures, including appropriate communication procedures, during the assessment.
- Your failure to take prompt corrective action when required.

The assessor will strictly adhere to pre-determined performance standards and scoring procedures and will document the outcome of the assessment on the *Assessment Control Sheet*.

Assessment Debriefing

The assessor should discuss the assessment results with you as soon as possible after the assessment. During the debriefing:

- The assessor should restate the assessment objective(s) and identify those that you successfully demonstrated.
- If applicable, you and the assessor should discuss the areas in which you need improvement, and then develop an improvement plan based on the lookout assessment outcome.

ASSESSMENT CONTROL SHEET

Section 1. Assessment Reference Information

1. Name of Candidate	2. Name of Designated Assessor
3. Date of Assessment	4. Vessel Name and Location

Section 2. STCW Reference Information

Assessment Area	<i>Performance of lookout duties.</i>
Assessment Method	Shipboard assessment.
STCW Requirement	1995 <i>STCW Code</i> , Section A-II/4, p. 68 – Mandatory minimum requirements for certification of ratings forming part of a navigational watch.
STCW Function	Navigation at the support level.
STCW Competence	Keep a proper lookout by sight and hearing.
STCW Proficiency	Responsibilities of a lookout, including reporting the approximate bearing of a sound signal, light, or other object in degrees or points.

Section 3. Assessment Objectives, Methods, and Scores

Worksheet	Assessment Objective	Assessment Methods	Score
I	1. Describe lookout duties and responsibilities.	Answers, explanations, and demonstrations at the lookout station in response to assessor questions.	☐ Pass
	2. Identify lookout stations and safe routes onboard.		☐ Fail
	3. Describe and identify the international distress signals.		
	4. Demonstrate lookout watch relief procedures.		
	5. Demonstrate the use of lookout equipment.		
II	6. Demonstrate lookout techniques and make lookout reports in clear visibility during daylight.	Practical demonstration at the lookout station during normal duties.	☐ Pass ☐ Fail
III	7. Demonstrate lookout techniques and make reports in clear visibility at night.	Practical demonstration at the lookout station during normal duties.	☐ Pass ☐ Fail
IV	8. Demonstrate lookout techniques and make lookout reports in restricted visibility during daylight or at night.	Practical demonstration at the lookout station during normal duties.	☐ Pass ☐ Fail
NOTE: Successful performance on the entire assessment requires a passing score on all worksheets.			☐ Pass ☐ Fail
Overall Assessment Result			

Section 4. Assessment Worksheet Summary

Assessment Worksheet	Assessment Objective	Action
I	1. Describe lookout duties and responsibilities.	1.1 Describe lookout duties and responsibilities. 1.2 List sightings that should be reported when detected. 1.3 Demonstrate knowledge of the point system for reporting sightings. 1.4 Demonstrate knowledge of the relative bearing system for reporting sightings. 1.5 Demonstrate knowledge of the procedure for reporting sightings on this vessel.
	2. Identify lookout stations and safe routes onboard.	2.1 Identify lookout stations onboard. 2.2 Identify safe routes to and from lookout stations.
	3. Describe and identify the international distress signals.	3.1 Describe and identify the international distress signals.
	4. Demonstrate lookout watch relief procedures.	4.1 Demonstrate an understanding of lookout watch relief procedure. 4.2 Demonstrate an understanding of nighttime lookout watch relief procedure. 4.3 Demonstrate knowledge of information to pass on to the lookout relief. 4.4 Demonstrate an understanding of the procedure in event of not being properly relieved.
	5. Demonstrate the use of lookout equipment.	5.1 Demonstrate the use and care of binoculars. 5.2 List personal equipment for lookout. 5.3 Locate personal and vessel safety equipment in the vicinity of lookout station.
II	6. Demonstrate lookout techniques and make lookout reports in clear visibility during daylight.	6.1 Report sighted objects using the agreed and accepted convention aboard.
		6.2 Report audible targets using the agreed and accepted convention aboard.
		6.3 Demonstrate the use of internal communication device.
III	7. Demonstrate lookout techniques and make lookout reports in clear visibility at night.	7.1 Report sighted objects using the agreed and accepted convention aboard.
		7.2 Report audible targets using the agreed and accepted convention aboard.
IV	8. Demonstrate lookout techniques and make lookout reports in restricted visibility during daylight or at night.	8.1 Report sighted objects using the agreed and accepted convention aboard.
		8.2 Report audible targets using the agreed and accepted convention aboard.

ASSESSMENT WORKSHEET I

Section 1. Assessment Conditions

Assessment Objectives	1. Describe lookout duties and responsibilities. 2. Identify lookout stations and safe routes onboard. 3. Describe and identify the international distress signals. 4. Demonstrate lookout watch relief procedures. 5. Demonstrate the use of lookout equipment.
Assessment Method	Answers, explanations, and demonstrations in response to assessor questions.
Candidate Orientation	Assessor briefs the candidate on assessment methods, conditions, and standards.
Required Equipment, Apparatus, and/or Tools	Examination proctor, test instrument, answers, and associated references.
Initial Condition	This assessment will be conducted before the practical demonstration of lookout skills.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

Action	Performance Measure	Performance Standard	Score
1.1 Describe lookout duties and responsibilities.	Answers question: <i>What are the duties and responsibilities of the lookout?</i>	Correctly describes a lookout's duties as sighting, identifying, and accurately reporting to the responsible authority all reportable objects or sounds detected.	☐ Pass ☐ Fail
1.2 List sightings that should be reported when detected. (continued on next page)	Answers question: <i>What are six sightings that should be reported when detected by the lookout?</i>	Correct answer includes six (6) of the following sightings: ☐ Distress signals. ☐ Persons in distress (man overboard, shipwrecked survivors, calls for help). ☐ Vessels and/or aircraft in distress. ☐ Derelicts, wreckage, floating or partially submerged debris. ☐ Pollution incident (oil spill, a sheen on the water). ☐ Vessel traffic and/or aircraft. ☐ Aids to navigation (navigation buoys and lights).	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
1.2 List sightings that should be reported when detected. (continued)	Answers question: What are six sightings that should be reported when detected by the lookout? (continued)	☐ Danger to the vessel or hazards to navigation (land, sighting or hearing breaking surf, obstructions, discoloration of the water). ☐ Reduction in visibility due to fog, mist, falling snow, heavy rainstorms, sandstorms, or any other similar cause. ☐ Change in weather. ☐ Hearing other vessels or aids to navigation (bell, gong, foghorn, or maneuvering signals). ☐ Ice. ☐ Unusual sightings or any unreported change in the field of view or sector. Sightings of marine life in compliance with the Endangered Species Act / Marine Mammal Protection Act (50 CFR 222), such as humpback or North Atlantic right whales, stellar sea lions, or sea turtles.	
1.3 Demonstrate knowledge of the point system for reporting sightings.	Answers question: <i>Describe the 32 point system for reporting sightings.</i>	Correctly describes or demonstrates the 32 point system.	☐ Pass ☐ Fail
1.4 Demonstrate knowledge of the relative bearing system for reporting sightings.	Answers question: <i>Describe the relative bearing system for reporting sightings.</i>	Correctly describes or demonstrates the relative bearing system.	☐ Pass ☐ Fail
1.5 Demonstrate knowledge of the procedure for reporting sightings on this vessel.	Answers questions: <i>Identify and describe the procedure for reporting sightings on this vessel (points, degrees relative, or degrees true).</i> <i>What are the three characteristics or features of a target that should be included in a report?</i>	Correctly answers both questions: Correctly identifies and describes the procedure for reporting sightings on the vessel. And Correctly identifies the following three target characteristics: ☐ Type of target. ☐ Bearing. ☐ Distance.	☐ Pass ☐ Fail
2.1 Identify lookout stations onboard.	Answers question: <i>Identify three common lookout stations on this vessel.</i>	Correctly identifies three common stations. Those most likely to be identified are: ☐ Bridge. ☐ Bridge wings. ☐ Bow.	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
2.2 Identify safe routes to and from lookout stations.	Answers question: <i>Identify the safe routes to the bow lookout station on this vessel.</i>	Correctly identifies safe routes to and from bow lookout station.	☐ Pass ☐ Fail
3.1 Identify the international distress signals.	Answers question: <i>What are six international distress signals?</i>	Correctly describes six of the following: ☐ Red star shells. ☐ Fog horn continuing sounding. ☐ Flames on a vessel. ☐ Gun fired at intervals of 1 minute. ☐ Orange background black ball & square. ☐ SOS. ☐ "Mayday" by radio. ☐ Parachute red flare. ☐ Dye marker (any color). ☐ Code flags November Charlie. ☐ Square flag and ball. ☐ Wave arms. ☐ Radiotelephone alarm. ☐ Position indicating radio beacon. ☐ Smoke.	☐ Pass ☐ Fail
4.1 Demonstrate understanding of lookout watch relief procedure.	Answers question: <i>When can a lookout leave his or her station before being relieved?</i>	Correct answer is <i>never</i> .	☐ Pass ☐ Fail
4.2 Demonstrate understanding of nighttime lookout watch relief procedures.	Answers question: <i>When being relieved during darkness, what is an important consideration before handing over the watch to your relief?</i>	Correct answer is that the lookout should ensure that his or her relief has established night vision before handing over the watch.	☐ Pass ☐ Fail
4.3 Demonstrate knowledge of information to pass on to the lookout relief.	Answers question: <i>What items of information constitute an adequate watch relief report?</i>	Correct answer includes all of these items: ☐ The location of any object(s) in sight. ☐ Object(s) previously reported. ☐ The present and past weather. ☐ Any special instructions or safety precautions. ☐ Brief description of your watch activities. ☐ The status of the navigation lights.	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
4.4 Demonstrate understanding of procedure in event of not being properly relieved.	Answers question: <i>What action do you take if you are not properly relieved?</i>	Correct answer indicates the he/she is to report to the bridge that no relief has arrived.	☐ Pass ☐ Fail
5.1 Demonstrate the use, care, and focusing of binoculars.	Detects visual targets using binoculars. Describes care and use of binoculars.	Correct performance in all of the following: ☐ Demonstrates focus by identifying far object requiring use of binoculars. ☐ Demonstrates systematic scanning technique. ☐ Identifies correct stowage procedures.	☐ Pass ☐ Fail
5.2 List personal equipment for lookout.	Answers question: <i>Identify the personal equipment you should bring with you when you perform lookout.</i>	Correct answer includes all of the following: ☐ Flashlight. ☐ Sunglasses. ☐ Foul weather gear. ☐ Hat.	☐ Pass ☐ Fail
5.3 Locate personal and vessel safety equipment in vicinity of lookout station.	Answers question: <i>What is the location of the life ring, PFD, survival suit, and fire extinguisher nearest to your lookout station?</i>	Correctly states nearest location of all equipment to a specified lookout station.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet I Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSMENT WORKSHEET II

Section 1. Assessment Conditions

Assessment Objective	6. Demonstrate lookout techniques and make lookout reports in clear visibility during daylight.
Assessment Method	Shipboard assessment and/or ship bridge simulator assessment.
Candidate Orientation	Assessor briefs the candidate on assessment methods, conditions, and standards.
Required Equipment, Apparatus, and/or Tools	The candidate should be posted at a lookout station equipped with an internal communications system, and the lookout station should be clear. The assessor can observe from the lookout station or be on the navigation bridge to hear all lookout reports.
Initial Conditions	The assessment should be conducted in clear visibility during daylight. The assessor should ensure there are reportable objects in sight.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

Action	Performance Measure	Performance Standard	Score
6.1 Report sighted objects using the agreed and accepted convention aboard.	Reports sighted objects.	Correctly reports at least 3 surface objects. Reports must include: ☐ What (objects or sounds). ☐ Where (bearings, relative or true). ☐ How far (hull-down, on the horizon, hull-up, close aboard). Reports must be +/- 2 points (or equiv.) of the actual bearing of detected targets. Failure to detect visible objects within a specified sector of view constitutes failure.	☐ Pass ☐ Fail
6.2 Report audible targets using the agreed and accepted convention aboard.	Reports audible target.	Verbally reports at least one audible target. Reports must be +/- 4 points (or equiv.) of the actual bearing of detected targets. Failure to detect an audible target within a specified sector of view constitutes failure. This standard may be met by verbal interview if reasonable opportunities to report audible targets are not available.	☐ Pass ☐ Fail
6.3 Demonstrate the use of internal communication device.	Reports sighted objects using internal communications.	Correctly uses the appropriate internal communications device to report all sightings during the assessment period.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Determine Worksheet II Pass/Fail status:	
Check Pass IF all measures were scored Pass.	☐ Pass
Check Fail IF one or more measures were scored Fail.	☐ Fail
Transfer the final Worksheet II Pass/Fail score to the <i>Assessment Control Sheet</i> .	

ASSESSMENT WORKSHEET III

Section 1. Assessment Conditions

Assessment Objective	7. Demonstrate lookout techniques and make lookout reports in clear visibility at night.
Assessment Method	Shipboard assessment and/or ship bridge simulator assessment.
Candidate Orientation	Assessor briefs the candidate on assessment methods, conditions, and standards.
Required Equipment, Apparatus, and/or Tools	The candidate should be posted at a lookout station equipped with an internal communications system, and the lookout station should be clear. The assessor can observe from the lookout station or be on the navigation bridge to hear all lookout reports.
Initial Conditions	The assessment should be conducted in clear visibility at night. The assessor should ensure there are reportable objects in sight.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

Action	Performance Measure	Performance Standard	Score
7.1 Report sighted objects using the agreed and accepted convention aboard.	Reports sighted objects.	Verbally reports at least 3 surface objects. Reports must include: ☐ What (objects or sounds). ☐ Where (bearings, relative or true). ☐ How far (hull-down, on the horizon, hull-up, close aboard). Reports must be +/- 2 points (or equiv.) of the actual bearing of detected targets. Failure to detect visible objects within a specified sector of view constitutes failure.	☐ Pass ☐ Fail
7.2 Report audible targets using the agreed and accepted convention aboard.	Reports audible target.	Verbally reports at least one audible target. Reports must be +/- 4 points (or equiv.) of the actual bearing of detected targets. Failure to detect an audible target within a specified sector of view constitutes failure. This standard may be met by verbal interview if reasonable opportunities to report audible targets are not available.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Determine Worksheet III Pass/Fail status: Check Pass IF both measures were scored Pass. Check Fail IF one or more measures were scored Fail. Transfer the final Worksheet III Pass/Fail score to the Assessment Control Sheet.	☐ Pass ☐ Fail
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ASSESSMENT WORKSHEET IV

Section 1. Assessment Conditions

Assessment Objective	8. Demonstrate lookout techniques and make lookout reports in restricted visibility.
Assessment Method	Shipboard assessment and/or ship bridge simulator assessment.
Candidate Orientation	Assessor briefs the candidate on assessment methods, conditions, and standards.
Required Equipment, Apparatus, and/or Tools	The candidate should be posted at a lookout station equipped with an internal communications system, and the lookout station should be clear. The assessor can observe from the lookout station or be on the navigation bridge to hear all lookout reports.
Initial Conditions	The assessment should be conducted in restricted visibility during daylight or at night. The assessor should ensure there are reportable objects in sight.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

Action	Performance Measure	Performance Standard	Score
8.1 Report sighted objects using the agreed and accepted convention aboard.	Reports sighted objects.	Verbally reports at least 3 surface objects. Reports must include: ☐ What (objects or sounds). ☐ Where (bearings, relative or true). ☐ How far (hull-down, on the horizon, hull-up, close aboard). Reports must be +/- 2 points (or equiv.) of the actual bearing of detected targets. Failure to detect visible objects within a specified sector of view constitutes failure.	☐ Pass ☐ Fail
8.2 Report audible targets using the agreed and accepted convention aboard.	Reports audible target.	Verbally reports at least one audible target. Reports must be +/- 4 points (or equiv.) of the actual bearing of detected targets. Failure to detect an audible target within a specified sector of view constitutes failure. This standard may be met by verbal interview if reasonable opportunities to report audible targets are not available.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Determine Worksheet IV Pass/Fail status: Check Pass IF both measures were scored Pass. Check Fail IF one or more measures were scored Fail. Transfer the final Worksheet IV Pass/Fail score to the <i>Assessment Control Sheet</i> .	☐ Pass ☐ Fail
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ASSESSOR COMMENTS

This page is provided for assessors to record their observations and comments regarding assessment conditions or limitations that may have affected the validity or reliability of the assessment outcome.

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APPENDIX C

MARINER ASSESSMENT PROCEDURES FOR PREPARING THE MAIN ENGINE FOR OPERATION

Maynard, G. E., Martinez, N., Jackson, P., and McCallum, M. C.

This appendix provides procedures used during the shipboard assessment trials performed by SeaRiver Maritime, Incorporated (SRM), with the assistance of the U.S. Coast Guard Research and Development Center. The procedures in this appendix were used in the trial assessment to assess a mariner's ability to prepare the main engine for operation. Included are assessor instructions, candidate instructions, five assessment worksheets, and an assessment control sheet for documenting the final results of the assessment.

A SRM senior engineer adapted existing assessment procedures specifically to the company's procedures, the ships' diesel-powered engines and engine room configuration, and had the new procedures verified by colleagues. During the earliest trials, they added self-contained directions to facilitate assessment by regular ship engineers standing regular watches. A more detailed discussion of their adaptation appears in Chapter 1, subsection *Adapting and Preparing Procedures for Use in Onboard Assessments*. The remainder of Chapter 1 contains numerous references to the importance of integrating assessments into the ship's operations if the assessment is to be effective with minimal interference with those operations. The assessment procedures are offered here specifically as samples or illustrations of an assessment process. They should be modified and adapted for use by any other company or ship if it is determined that these procedures do not satisfy company policy or the type of engines and engine room configuration.

A major concern in the preparation of the assessment procedures was the establishment of a standard of performance to be expected, i.e., what is a passing grade? Did a candidate need to pass 100% of the items to be considered proficient in the task, or would an alternative standard be acceptable? For example, in a training environment, it may well be acceptable to pass the majority of the items and receive a passing grade on the entire assessment for the purpose of obtaining a course grade. However, it was deemed that professional mariners onboard ship should be expected to properly execute all of the steps of a procedure, particularly those for starting up and securing a system or specific equipment, to be considered proficient in the task. Thus, if any single item is not passed, the candidate will not be given credit for the assessment and must repeat the demonstration at a later date.

This sample assessment is for illustrative purposes only. It is NOT intended as the standard for general industry use, and is not to be interpreted as U. S. Coast Guard policy.

This report may be downloaded from the U.S. Coast Guard Research and Development Center web site at <http://www.rdc.uscg.mil>.

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ASSESSOR INSTRUCTIONS

Introduction

The following procedures are designed to assess a candidate's ability to prepare the main engine of a ship for operation, including starting the main engine and preparing the control system. This package was specifically developed for a propulsion system with one reversible, slow-speed diesel engine driving one shaft. With some modification, this package may be applicable to propulsion plants that have other single, slow-speed diesel engines.

The assessment materials include *Assessor Instructions*, *Candidate Instructions*, an *Assessment Control Sheet*, and five separate assessment modules (*Assessment Worksheets I-V*). The *Assessor Instructions* describe the assessment objectives, method, conditions, measures, and standards. The *Assessor Instructions* also list the responsibilities of the assessor during each phase of the assessment process in an *Assessment Checklist*. The *Candidate Instructions* explain the assessment process from the candidate's perspective and define the responsibilities of the candidate.

The *Assessment Control Sheet* provides a record of the assessment. It includes the names of the candidate and assessor, the date and location of the assessment, and the STCW reference information for the competence area being assessed. Section 3 of the *Assessment Control Sheet* provides space for the assessor to record the assessment results for each worksheet. Finally, Section 4 of the control sheet summarizes the actions to be assessed, as they correspond to each assessment worksheet and objective.

As the assessor, you will evaluate the candidate's ability to meet the performance standards specified for each action in the assessment worksheets. Using the scoring procedures for each worksheet, you will provide the candidate with a separate score and pass/fail result for each worksheet and compile these results for the entire assessment on the *Assessment Control Sheet*.

The rest of this section briefly describes the various components of this assessment. *Assessment Worksheets I* through *V* provide additional information about the assessment objectives, method, conditions, performance measures, and performance standards.

Assessment Objectives

In a step-by-step procedure, the candidate should safely prepare to start the main engine, including the following:

1. Perform engine auxiliaries pre-start checks.
2. Turn over the main engine and pre-lube.
3. Blow down main engine ahead and astern.
4. Transfer main engine controls, and start.
5. Prepare the plant to answer bells.

Assessment Method

This assessment is conducted onboard a vessel in the actual work setting. Most of the assessment involves the observation and verification of candidate actions. In addition, the candidate is asked to answer several questions during the course of the assessment.

Assessment Conditions

This assessment should begin at the local engine control station. The candidate should then work throughout the engine room. As the assessor, you should tell the candidate the next activity to complete, but not the individual actions necessary to complete the activity. The candidate will not receive any assistance from others, except to check pressure and temperature levels as required during the assessment.

Performance Measures and Standards

Each assessment objective is comprised of one or more actions. Each action has one or more corresponding performance measure(s) and standard(s). For example, Assessment Objective 1 is comprised of six separate actions and multiple performance measures (see Section 2 of *Assessment Worksheet I* on pages 10 through 12).

Assessment Checklist

The following checklist summarizes the tasks and responsibilities of the assessor at each phase of the assessment process.

Preparing for the Assessment

- ☐ Review the Assessment Control Sheet, Assessment Worksheets, and Candidate Instructions.
- ☐ Schedule the assessment and inform all affected personnel.
- ☐ Inform the engineering watch officer, bridge watch officer, and candidate(s) of the date and time of assessment.
- ☐ Get communication equipment and personal safety equipment for yourself and the candidate(s).

Briefing the Candidate before the Assessment

- ☐ Provide the candidate with a copy of the *Candidate Instructions* and *Assessment Control Sheet* for this assessment.
- ☐ Review the preparing main engine assessment instructions with the candidate and answer any questions.
- ☐ Advise the candidate of the time constraints, including when the assessment will begin and under what circumstances the assessment will be terminated.
- ☐ Discuss the desired outcome(s) and consequences of failing to perform part or all of the main engine preparation assessment.

- ☐ Remind the candidate that it is permissible to ask questions during the assessment, especially if he or she has a safety concern.
- ☐ Inform the candidate that all phases of the assessment are to be conducted in English.
- ☐ Discuss the candidate's willingness to be assessed under the circumstances presented.
- ☐ Ensure that the candidate has the proper equipment to carry out the assessment:
 - Small notebook and pencil for writing down conditions and readings.
 - Wrenches used for opening valves.
 - Long-sleeved clothing.
 - Pair of work gloves, safety glasses, ear plugs, and hard hat.

Observing the Candidate's Performance

- ☐ If a safety violation occurs, terminate the assessment immediately.
- ☐ Continuously observe the candidate during the assessment. Require that standard procedures or company policy be adhered to, except when assessment procedures require demonstration of knowledge or skill different from a convention adopted by the company.
- ☐ Ensure realistic assessment conditions consistent with a normal working environment for the engineer. Ensure that the candidate can concentrate on the task at hand.
- ☐ Avoid asking leading questions. Try to keep your questions fair but general in nature.
- ☐ Avoid giving the candidate unsolicited assistance but respond to appropriate questions and provide appropriate equipment when required.
- ☐ Remain objective and maintain positive control of the assessment process at all times.

Recording Results and Determining Assessment Outcome

- ☐ Record performance on the appropriate *Assessment Worksheet*.
- ☐ The performance standards specified on each *Assessment Worksheet* should be strictly followed.
- ☐ Determine and document the outcome for each *Assessment Worksheet*, then transfer the final results to the *Assessment Control Sheet*.

Debriefing the Candidate

- ☐ Debrief the candidate as soon as possible after the assessment.
- ☐ Restate the assessment objectives.
- ☐ Focus on positive accomplishments first.
- ☐ Identify the specific areas needing improvement.
- ☐ If the candidate failed to demonstrate proficiency, jointly develop an improvement plan to prepare for reassessment.

Assessor Comments

The *Assessor Comments* page is provided for assessors to record their observations and comments regarding assessment conditions or limitations that may have affected the validity or reliability of the assessment outcome.

Reassessment Procedure

The candidate may request reassessment, which may be conducted no sooner than 48 hours after the final debriefing. Reassessment can be limited to those worksheets that were not previously passed. However, a score of 100% is required on all worksheets used in reassessment.

CANDIDATE INSTRUCTIONS

In this assessment, you will be evaluated on your ability to safely prepare the main engine for operation. Table C-1 shows the 1995 STCW Code specification for preparing the main engine for operation.

Table C-1. STCW Code - Specification for preparing the main engine for operation.

STCW Requirement	1995 <i>STCW Code</i> , Section A-III / 1 (p. 75): Mandatory minimum requirements for certification of ratings for officers in charge of an engineering watch in a manned engine room or designated duty engineers in a periodically unmanned engine room.
STCW Function	Marine engineering at the operational level.
STCW Competence	Operate main and auxiliary machinery and associated control systems.
STCW Proficiency	Preparation of the main machinery and preparation of auxiliary machinery for operation.

Assessment Objectives and Method

Your assessment will occur onboard ship. A qualified assessor will assess your ability to meet the five assessment objectives in the first column of Table C-2. Note that your performance will be assessed by "practical demonstration." Performance assessed by demonstration means your assessor will ask you to demonstrate your ability to perform the actions required in the objective.

Table C-2. Assessment objectives and method for preparing the main engine for operation.

Assessment Objective	Assessment Type
1. Perform engine auxiliaries pre-start checks.	Practical demonstration during normal duties.
2. Turn over the main engine and pre-lube.	
3. Blow down main engine ahead and astern.	
4. Transfer main engine controls, and start.	
5. Prepare plant to answer bells.	

Below are some general guidelines for what you should expect during the assessment process.

Pre-Assessment Briefing with Assessor

This briefing should occur a minimum of one day before the scheduled assessment. This will help you and the assessor to be well prepared for the assessment when it actually occurs. During this briefing, you should:

- Discuss your prior experience, training, and/or company policy with the assessor. On the basis of these qualifications, discuss whether you are qualified to undertake the main engine preparation assessment. If you both agree you are qualified, then continue with the assessment process. If not, arrange for additional training, and set a date for another review of your qualifications.
- Review the main engine preparation assessment objectives and methods (Table C-2), and

ask any questions you have about them.

- Discuss the desired outcome(s) and the consequences of failing to perform any part of the main engine preparation assessment.
- Discuss the general main engine preparation assessment procedures. Your assessor will inform you of how much time is allowed, when the assessment begins, and under what circumstances he or she will terminate the assessment.
- Consider whether you are willing to be assessed under the circumstances presented and advise the assessor of your willingness to undertake the assessment.

Participation in the Assessment

You are expected to adhere to standard procedures or company policy. During the assessment, remember to:

- Listen to an entire question before responding or acting. Remember that you may not use reference material during the assessment examination, other than copies of ship's operating procedures and standing orders.
- Ask questions if you have a safety concern. If a safety violation occurs, the assessor will terminate the assessment immediately.

To the extent practical, the assessor will ensure that your assessment is conducted under normal working conditions.

The Outcome of Your Assessment

The assessor will record your performance on a series of *Assessment Worksheets*. The assessor will score each performance measure on a "Pass/Fail" basis. Acceptable performance (a "Pass" score) will be based on your demonstrated ability to correctly respond to the questions that you are asked during the examination portions of the assessment. It will also be based on your ability to safely perform assigned tasks in a manner that demonstrates that you possess the required level of skill, knowledge, and ability, as well as sound and professional judgment.

If you receive a "Fail" score on a worksheet, or if you "Fail" any of the required performance standards, you will be asked to participate in a future reassessment, following further study or training.

Note that the following events will terminate an assessment immediately:

- An action, or lack of action, by you which required corrective action or intervention by the assessor to prevent injury, damage, or the development of a hazardous condition.
- Your failure to use proper procedures, including appropriate communication procedures, during the assessment.
- Your failure to take prompt corrective action when required.

The assessor will strictly adhere to pre-determined performance standards and scoring procedures and will document the outcome of the assessment on the *Assessment Control Sheet*.

Assessment Debriefing

The assessor should discuss the assessment results with you as soon as possible after the assessment. During the debriefing:

- The assessor should restate the assessment objective(s) and identify those that you successfully demonstrated.
- If applicable, you and the assessor should discuss the areas in which you need improvement, and then develop an improvement plan based on the main engine preparation assessment outcome.

ASSESSMENT CONTROL SHEET

Section 1. Assessment Reference Information

1. Name of Candidate	2. Name of Designated Assessor
3. Date of Assessment	4. Vessel Name and Location

Section 2. STCW Reference Information

Assessment Area	<i>Preparing the main diesel engines for operation.</i>
Assessment Method	Shipboard assessment.
STCW Requirement	STCW Code, Section A-III / 1, p. 75 – Mandatory minimum requirements for certification of ratings for officers in charge of an engineering watch in a manned engine room or designated duty engineers in a periodically unmanned engine room.
STCW Function	Marine engineering at the operational level.
STCW Competence	Operate main and auxiliary machinery and associated control systems.
STCW Proficiency	Preparation of main machinery for operation.

Section 3. Assessment Objectives, Methods, and Scores

Worksheet	Assessment Objective	Assessment Methods	Score
I	1. Perform engine auxiliaries pre-start checks.	Practical demonstration during normal duties.	☐ Pass ☐ Fail
II	2. Turn over the main engine and pre-lube.	Practical demonstration during normal duties.	☐ Pass ☐ Fail
III	3. Blow down main engine ahead and astern.	Practical demonstration during normal duties.	☐ Pass ☐ Fail
IV	4. Transfer main engine controls, and start.	Practical demonstration during normal duties.	☐ Pass ☐ Fail
V	5. Prepare plant to answer bells.	Practical demonstration during normal duties.	☐ Pass ☐ Fail
NOTE: Successful performance on the entire assessment requires a passing score on all worksheets.			Overall Assessment Result ☐ Pass ☐ Fail

Section 4. Assessment Worksheet Summary

Assessment Worksheet	Assessment Objective	Action
I	1. Perform engine auxiliaries pre-start checks.	1.1 Verifies that HFO system is ready for service. 1.2 Verifies that jacket water system is ready for service. 1.3 Verifies that piston cooling system is ready for service. 1.4 Verifies that injector cooling water system is ready for service. 1.5 Verifies that main engine lube oil system is ready for service. 1.6 Determines status of main engine controls.
II	2. Turn over the main engine and pre-lube.	2.1 Pre-lube and turn over engine.
III	3. Blow down main engine ahead and astern.	3.1 Observe proper procedures prior to blowing down engine. 3.2 Blow down main engine.
IV	4. Transfer main engine controls, and start.	4.1 Prepare main engine to start on fuel. 4.2 Transfer control to remote location. 4.3 Start, stop, reverse, and stop main engine.
V	5. Prepare plant to answer bells.	5.1 Procedures for getting underway are followed and logged.

ASSESSMENT WORKSHEET I

Section 1. Assessment Conditions

Assessment Objective	1. Perform engine auxiliaries pre-start checks.
Assessment Method	Answers, explanations, and demonstrations in response to assessor questions.
Candidate Orientation	The candidate should be highly familiar with the procedures for preparing the main engine for operation. One candidate will be assessed at a time. The assessor will observe normal activities, but may ask for clarification at any time. The candidate is encouraged to explain his or her actions throughout the course of the assessment.
Required Equipment, Apparatus, and/or Tools	The candidate should begin the assessment at the engineer's local operating console. Main engine and supporting equipment should be secured but operational and available for use. All required auxiliary systems should be lined up and operational.
Initial Conditions	The assessor should have received clearance from both the bridge and engineering watch officer to begin the assessment. The area should be clear so the assessor can observe activities. This assessment is an evaluation of the candidate's ability to start the main engine under normal conditions. Abnormal conditions will not be introduced. If abnormal conditions arise, the assessment will be suspended until the condition is corrected.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Action*, *Performance Measure*, or *Performance Standard* was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
1.1 Verifies that HFO system is ready for service. (continued on next page)	Checks HFO settling tank parameters.	Verifies that level and temperature are within acceptable parameters.	☐ Pass ☐ Fail
	Checks HFO service tank parameters.	Verifies that level and temperature are within acceptable parameters.	☐ Pass ☐ Fail
	Checks purifier.	Verifies that purifier is running & lined up from settling tank to service tank.	☐ Pass ☐ Fail
	Checks HFO booster pump.	- Verifies that HFO booster pump is running and stand by pump lined up. And - Verifies proper pressure at engine.	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
	Verifies that injectors are ready.	- Verifies injectors bled of air. And - Verifies fuel at proper temperature / viscosity at engine.	☐ Pass ☐ Fail ☐ N/A
1.2 Verifies that jacket water system ready for service.	Checks jacket water head tank.	Verifies that level is full.	☐ Pass ☐ Fail
	Checks jacket water pumps ready.	Verifies all three: ☐ Pump running. ☐ Standby pump lined up and in standby. ☐ Proper system pressure.	☐ Pass ☐ Fail ☐ N/A
	Checks jacket water heater / cooler working.	Verifies system at correct temperature.	☐ Pass ☐ Fail
1.3 Verifies that piston cooling system ready for service.	Checks piston cooling water tank.	- Verifies proper normal operating level. And - Verifies free of oil.	☐ Pass ☐ Fail
	Checks piston cooling pumps ready.	Verifies all three: ☐ Main pump on. ☐ Proper pressure. ☐ Standby pump lined up and in standby.	☐ Pass ☐ Fail
	Verifies that piston cooling water cooler / heater working.	Verifies that system at proper temperature.	☐ Pass ☐ Fail
1.4 Verifies that injector cooling water system is ready for service.	Checks injector cooling water tank.	- Verifies normal operating level. And - Verifies free of oil.	☐ Pass ☐ Fail ☐ N/A
	Verifies that injector cooling water pumps ready.	Verifies all three: ☐ Main pump running. ☐ Stand by pump lined up and in stand by. ☐ System at proper pressure.	☐ Pass ☐ Fail ☐ N/A
	Verifies that injector cooling water cooler working.	Verifies that system in proper temperature range for fuel.	☐ Pass ☐ Fail ☐ N/A

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
1.5 Verifies that main engine lube oil system ready for service.	Verifies that main engine lube oil system ready.	Verifies all five: ☐ Main engine sump oil level is normal. ☐ Main lube oil pump running. ☐ Standby lube oil pump lined up and in standby. ☐ System at proper bearing pressure. ☐ System has proper control oil pressure.	☐ Pass ☐ Fail
	Main engine cylinder oil system is ready.	• Cylinder lube oil day tank has sufficient oil. And • All cylinder lubricators are working, oil going to all points, by inspecting flow balls on lubricators.	☐ Pass ☐ Fail
	Main engine crosshead lube oil system ready.	Verifies all three: ☐ Crosshead lube oil pump is running. ☐ Standby crosshead lube oil pump is lined up and in standby. ☐ Crosshead pump is at normal pressure.	☐ Pass ☐ Fail
1.6 Determines status of main engine controls.	Identify proper status control of the main engine.	• Main engine should be on Engine Room Control.	☐ Pass ☐ Fail
	Identify proper status of auto start control valve.	• Auto starting air valve should be manually closed.	☐ Pass ☐ Fail
	Identify proper status of jacking gear.	• Jacking gear should be engaged.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet I Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSMENT WORKSHEET II

Section 1. Assessment Conditions

Assessment Objective	2. Turn over the main engine and pre-lube.
Assessment Method	Practical shipboard demonstration by the candidate.
Candidate Orientation	The candidate should be highly familiar with the procedures for preparing the main engine for operation. One candidate will be assessed at a time. The assessor will observe normal activities, but may ask for clarification at any time. The candidate is encouraged to explain his or her actions throughout the course of the assessment.
Required Equipment, Apparatus, and/or Tools	The candidate should begin the assessment at the engineer's local operating console. Main engine and supporting equipment should be secured but operational and available for use. All required auxiliary systems should be lined up and operational.
Initial Conditions	The assessor should have received clearance from both the bridge and engineering watch officer to begin the assessment. The area should be clear so the assessor can observe activities. This assessment is an evaluation of the candidate's ability to start the main engine under normal conditions. Abnormal conditions will not be introduced. If abnormal conditions arise, the assessment will be suspended until the condition is corrected.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Action*, *Performance Measure*, or *Performance Standard* was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
2.1 Pre-lube and turn over engine.	Identify if it is safe to turn engine over.	- Request permission from the Bridge that the prop is clear and it is ok to turn the prop. And - All cylinder indicator cocks are open.	☐ Pass ☐ Fail
	Complete any additional actions as appropriate.	Ensure that piston underside drain valves are in proper position.	☐ Pass ☐ Fail ☐ N/A
	Rotate engine.	Start jacking gear and rotate engine 1 – 2 revolutions.	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
	Pre-lube engine.	Verifies all three: ☐ Pre-lube engine appropriate amount on pre-lube pump, while rotating over. ☐ Check condition of cylinders by observing if any liquid comes out of each cylinder's indicator cocks. ☐ Identify when it is not safe to start engine, and what the problems could be.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet II Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet II Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSMENT WORKSHEET III

Section 1. Assessment Conditions

Assessment Objective	3. Blow down main engine ahead and astern.
Assessment Method	Practical shipboard demonstration by the candidate.
Candidate Orientation	The candidate should be highly familiar with the procedures for preparing the main engine for operation. One candidate will be assessed at a time. The assessor will observe normal activities, but may ask for clarification at any time. The candidate is encouraged to explain his or her actions throughout the course of the assessment.
Required Equipment, Apparatus, and/or Tools	The candidate should begin the assessment at the engineer's local operating console. Main engine and supporting equipment should be secured but operational and available for use. All required auxiliary systems should be lined up and operational.
Initial Conditions	The assessor should have received clearance from both the bridge and engineering watch officer to begin the assessment. The area should be clear so the assessor can observe activities. This assessment is an evaluation of the candidate's ability to start the main engine under normal conditions. Abnormal conditions will not be introduced. If abnormal conditions arise, the assessment will be suspended until the condition is corrected.

Section 2. Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Action*, *Performance Measure*, or *Performance Standard* was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
3.1 Observe proper procedures prior to blowing down engine.	Engine is mechanically safe to blow over.	- Jacking gear is disengaged. And - All cylinder indicator cocks are still open.	☐ Pass ☐ Fail
	Starting air system is ready to start engine.	Verifies all three: ☐ Auto air start valve is opened to auto position. ☐ Starting air system is at proper pressure. ☐ Standby starting air compressor is lined up and in standby.	☐ Pass ☐ Fail
	Engine charge air systems are ready.	- Auxiliary blower / blowers are in auto. And - Turbo charger / chargers are ready with proper oil levels.	☐ Pass ☐ Fail

Section 2. Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
3.2 Blow down main engine.	Procedure for blowing down engine is followed.	Request permission from Bridge to Blow engine ahead and astern.	☐ Pass ☐ Fail
	Observation of proper interaction of controls and engine response when engine is blown down.	When throttle is moved both ahead and astern, reversing cam shifts in the proper direction.	☐ Pass ☐ Fail
	Observation of proper air start valves when engine is blown down.	Observe all air start valves are working during starting.	☐ Pass ☐ Fail ☐ N/A
	Observation of indicator cocks.	- Observe all indicator cocks for liquid coming out during blow down. And - Question what action is to be taken if liquid is observed and how much.	☐ Pass ☐ Fail
	Check charge air systems during and after blow down.	- Observe if auxiliary blower / blowers came on. And - Observe turbo charger / chargers spinning over and oil pumps pumping oil to bearings.	☐ Pass ☐ Fail
	Check air starts system after blow down.	- Observe if standby air compressor cycled on. And - Observe if standby compressor pumped up system and cycled off.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet III Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet III Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSMENT WORKSHEET IV

Section 1. Assessment Conditions

Assessment Objective	4. Transfer main engine controls, and start.
Assessment Method	Practical shipboard demonstration by the candidate.
Candidate Orientation	The candidate should be highly familiar with the procedures for preparing the main engine for operation. One candidate will be assessed at a time. The assessor will observe normal activities, but may ask for clarification at any time. The candidate is encouraged to explain his or her actions throughout the course of the assessment.
Required Equipment, Apparatus, and/or Tools	The candidate should begin the assessment at the engineer's local operating console. Main engine and supporting equipment should be secured but operational and available for use. All required auxiliary systems should be lined up and operational.
Initial Conditions	The assessor should have received clearance from both the bridge and engineering watch officer to begin the assessment. The area should be clear so the assessor can observe activities. This assessment is an evaluation of the candidate's ability to start the main engine under normal conditions. Abnormal conditions will not be introduced. If abnormal conditions arise, the assessment will be suspended until the condition is corrected.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Action*, *Performance Measure*, or *Performance Standard* was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
4.1 Prepare main engine to start on fuel.	Prepare engine for running.	Close each cylinder indicator cocks.	☐ Pass
		And Inspect main engine for abnormalities.	☐ Fail
4.2 Transfer control to remote location.	Communicate transfer with remote location.	Initiate communication and asks if they are ready to accept control.	☐ Pass
	Transfer of control to remote location.	- Transfer control air control to remote location. And - Acknowledge transfer of control by button giving them control, and visual indicator.	☐ Fail

Section 2. Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
4.3 Start, stop, reverse, and stop main engine.	Maintain vigilance and monitor the operation during startup, stopping and reversing.	All of the following are required: ☐ Maintain close communication with bridge during test. ☐ Observe appropriate response of engine to throttle commands. ☐ Observe speed and verify it corresponds to telegraph. ☐ Observe that engine starts and listens for any unusual noises or signs that something is not right. ☐ Observe gauges and operation of engine and control.	☐ Pass ☐ Fail
	Answers question: <i>What do you do if things go wrong and you need to intervene?</i>	And • Explains how to take engine control in an emergency. • Explains how to use the emergency stop button, and overrides.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet IV Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet IV Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSMENT WORKSHEET V

Section 1. Assessment Conditions

Assessment Objective	5. Prepare plant to answer bells.
Assessment Method	Practical shipboard demonstration by the candidate.
Candidate Orientation	The candidate should be highly familiar with the procedures for preparing the main engine for operation. One candidate will be assessed at a time. The assessor will observe normal activities, but may ask for clarification at any time. The candidate is encouraged to explain his or her actions throughout the course of the assessment.
Required Equipment, Apparatus, and/or Tools	The candidate should begin the assessment at the engineer's local operating console. Main engine and supporting equipment should be secured but operational and available for use. All required auxiliary systems should be lined up and operational.
Initial Conditions	The assessor should have received clearance from both the bridge and engineering watch officer to begin the assessment. The area should be clear so the assessor can observe activities. This assessment is an evaluation of the candidate's ability to start the main engine under normal conditions. Abnormal conditions will not be introduced. If abnormal conditions arise, the assessment will be suspended until the condition is corrected.

Section 2. Action, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Performance Standard* was not applicable.

Action	Performance Measure	Performance Standard	Score
5.1 Procedures for getting underway are followed and logged in the logbook.	USCG procedure for testing the steering gears.	Steering gear and related equipment testing procedure followed, and logged appropriately in logbook.	☐ Pass ☐ Fail
	Standby generator is ready for use.	Generator running properly, and on line.	☐ Pass ☐ Fail
	Proper readings are recorded at standby.	Meter readings for fuel oil meters, KW meters, counters, accurate times and dates are recorded at standby.	☐ Pass ☐ Fail ☐ N/A
	Engine room properly manned.	Two qualified engineers are present in the engine room during maneuvering.	☐ Pass ☐ Fail ☐ N/A

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet V Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet V Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSOR COMMENTS

This page is provided for assessors to record their observations and comments regarding assessment conditions or limitations that may have affected the validity or reliability of the assessment outcome.

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APPENDIX D

MARINER ASSESSMENT PROCEDURES FOR TESTING THE STEERING GEAR FROM THE STEERING ENGINE ROOM

Maynard, G. E., Martinez, N., Jackson, P., and McCallum, M. C.

This appendix provides procedures used during the shipboard assessment trials performed by SeaRiver Maritime, Incorporated (SRM), with the assistance of the U.S. Coast Guard Research and Development Center. The procedures in this appendix were used in the trial assessment to assess a mariner's ability to test the steering gear. Included are assessor instructions, candidate instructions, four assessment worksheets, and an assessment control sheet for documenting the final results of the assessment.

A SRM senior engineer developed the assessment procedures specifically for the company's procedures and the ships' steering equipment, and had the procedures verified by colleagues. During the earliest trials, they added self-contained directions to facilitate assessment by regular ship engineers standing regular watches. A more detailed discussion of their adaptation appears in Chapter 1, subsection *Adapting and Preparing Procedures for Use in Onboard Assessments*. The remainder of Chapter 1 contains numerous references to the importance of integrating assessments into the ship's operations if the assessment is to be effective with minimal interference with those operations. The assessment procedures are offered here specifically as samples or illustrations of an assessment process. They should be modified and adapted for use by any other company or ship if it is determined that these procedures do not satisfy company policy or the type of steering system installation.

A major concern in the preparation of the assessment procedures was the establishment of a standard of performance to be expected, i.e., what is a passing grade? Did a candidate need to pass 100% of the items to be considered proficient in the task, or would an alternative standard be acceptable? For example, in a training environment, it may well be acceptable to pass the majority of the items and receive a passing grade on the entire assessment for the purpose of obtaining a course grade. However, it was deemed that professional mariners onboard ship should be expected to properly execute all of the steps of a procedure, particularly those for starting up and securing a system or specific equipment, to be considered proficient in the task. Thus, if any single item is not passed, the candidate will not be given credit for the assessment and must repeat the demonstration at a later date.

This sample assessment is for illustrative purposes only. It is NOT intended as the standard for general industry use, and is not to be interpreted as U. S. Coast Guard policy.

This report may be downloaded from the U.S. Coast Guard Research and Development Center web site at <http://www.rdc.uscg.mil>.

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ASSESSOR INSTRUCTIONS

Introduction

The following procedures are designed to assess a candidate's ability to test the steering gear. The candidate must be familiar with the testing requirements of the regulations, steering gear arrangement, procedures for how to operate and changeover main and auxiliary steering gears, and procedures for identifying faults, and taking corrective action to maintain operations.

This package was specifically developed for a generic steering gear system, which could be of the hydraulic ram or vane type. This is a general approach to the testing of the steering gear with the understanding that the manufacturer and company procedures take precedence. The steering gear test assessment is set up for two main steering gears and an emergency rudder-positioning unit. However, this package may be applicable to any hydraulic steering gear system designed for shipboard operations.

The assessment materials include *Assessor Instructions*, *Candidate Instructions*, an *Assessment Control Sheet*, and four separate assessment modules (*Assessment Worksheets I-IV*). The *Assessor Instructions* describe the assessment objectives, method, conditions, measures, and standards. The *Assessor Instructions* also list the responsibilities of the assessor during each phase of the assessment process in an *Assessment Checklist*. The *Candidate Instructions* explain the assessment process from the candidate's perspective and define the responsibilities of the candidate.

The *Assessment Control Sheet* provides a record of the assessment. It includes the names of the candidate and assessor, the date and location of the assessment, and the STCW reference information for the competence area being assessed. Section 3 of the *Assessment Control Sheet* provides space for the assessor to record the assessment results for each worksheet. Finally, Section 4 of the control sheet summarizes the actions to be assessed, as they correspond to each assessment worksheet and objective.

As the assessor, you will evaluate the candidate's ability to meet the performance standards specified for each action in the assessment worksheets. Using the scoring procedures for each worksheet, you will provide the candidate with a separate score and pass/fail result for each worksheet and compile these results for the entire assessment on the *Assessment Control Sheet*.

The rest of this section briefly describes the various components of this assessment. *Assessment Worksheets I* through *IV* provide additional information about the assessment objectives, method, conditions, performance measures, and performance standards.

Assessment Objectives

During this assessment, the candidate should demonstrate the following abilities:

- Knowledge of steering gear testing regulation requirements.
- Operational pretest check procedures.
- Testing of the internal communication systems.
- Testing of the steering gear systems.

Assessment Method

This assessment is conducted onboard a vessel in the actual work setting. Most of the assessment involves the observation and verification of candidate actions. In addition, the candidate is asked to answer several questions during the course of the assessment.

Assessment Conditions

The assessment should take place at dock or at anchor, and begin at the local engine control room where permission is obtained from the Captain and Chief Engineer to carry out the assessment. The candidate should then answer questions demonstrating his or her knowledge of the regulation requirements. The candidate may assign someone to verify alarms and help test communication equipment on the bridge and in the engine control room. The rest of the assessment should be performed in the steering engine room and completed in the control room.

Performance Measures and Standards

Each assessment objective is comprised of one or more actions. Each action has one or more corresponding performance measure(s) and standard(s). For example, Assessment Objective 1 is comprised of two separate actions and multiple performance measures (see Section 2 of *Assessment Worksheet I* on pages 10 and 11).

Assessment Checklist

The following checklist summarizes the tasks and responsibilities of the assessor at each phase of the assessment process.

Preparing for the Steering Assessment

- ☐ Gather steering gear testing assessment materials.
- ☐ Ensure that the bridge watch officer is available to assist in the testing of the steering gear.
- ☐ Review the *Assessment Control Sheet*, *Assessment Worksheets*, and *Candidate Instructions*.
- ☐ Ensure that the appropriate conditions are present for the assessment being conducted and

that the vessel is clear of navigational hazards.

- ❑ Identify and observe necessary safety precautions.
- ❑ Schedule the assessment and inform all affected personnel.

Briefing the Candidate before the Assessment

- ❑ Provide the candidate with a copy of the *Candidate Instructions* for this assessment.
- ❑ Review the steering gear testing assessment instructions with the candidate and answer any questions.
- ❑ Advise the candidate of the time constraints, including when the assessment will begin and under what circumstances the assessment will be terminated.
- ❑ Discuss the desired outcome(s) and consequences of failing to perform part or all of the steering gear testing assessment.
- ❑ Remind the candidate that it is permissible to ask questions during the assessment, especially if he or she has a safety concern.
- ❑ Inform the candidate that all phases of the assessment are to be conducted in English.
- ❑ Discuss the candidate's willingness to be assessed under the circumstances presented.
- ❑ Ensure that the candidate has the proper equipment to carry out the assessment:
 - Small notebook and pencil for writing down conditions and readings.
 - Wrenches used for opening valves.
 - Long-sleeved clothing.
 - Pair of work gloves, safety glasses, ear plugs, and hard hat.

Observing the Candidate's Performance

- ❑ If a safety violation occurs, terminate the assessment immediately.
- ❑ Continuously observe the candidate during the assessment. Require that standard procedures or company policy be adhered to, except when assessment procedures require demonstration of knowledge or skill different from a convention adopted by the company.
- ❑ Ensure realistic assessment conditions consistent with a normal working environment for the engineer. Ensure that the candidate can concentrate on the task at hand. Do not allow other crewmembers to interfere with the assessment. Do not allow the candidate to "learn the test" by observing the performance of other assessment candidates.
- ❑ Avoid asking leading questions. Try to keep your questions fair but general in nature.
- ❑ Avoid giving the candidate unsolicited assistance but respond to appropriate questions and provide appropriate equipment when required.
- ❑ Remain objective and maintain positive control of the assessment process at all times.

Recording Results and Determining Assessment Outcome

- ❑ Record performance on the appropriate *Assessment Worksheet*.
- ❑ The performance standards specified on each *Assessment Worksheet* should be strictly followed.
- ❑ Determine and document the outcome for each *Assessment Worksheet*, then transfer the final results to the *Assessment Control Sheet*.

Debriefing the Candidate

- ❑ Debrief the candidate as soon as possible after the assessment.
- ❑ Restate the assessment objectives.
- ❑ Focus on positive accomplishments first.
- ❑ Identify the specific areas needing improvement.
- ❑ If the candidate failed to demonstrate proficiency, jointly develop an improvement plan to prepare for reassessment.

Assessor Comments

The *Assessor Comments* page is provided for assessors to record their observations and comments regarding assessment conditions or limitations that may have affected the validity or reliability of the assessment outcome.

Reassessment Procedure

The candidate may request reassessment, which may be conducted no sooner than 48 hours after the final debriefing. Reassessment can be limited to those worksheets that were not previously passed. However, a score of 100% is required on all worksheets used in reassessment.

CANDIDATE INSTRUCTIONS

In this assessment, you will be evaluated on your knowledge of the regulations as they pertain to the testing of the steering gear system. You will be asked to demonstrate your ability to thoroughly inspect, test, and changeover steering gear systems. Table D-1 shows the 1995 STCW Code specification for testing the steering gear.

Table D-1. STCW Code - Specification for testing steering gear.

STCW Requirement	1995 <i>STCW Code</i> , Section A-III/2 (p. 83): Mandatory minimum requirements for certification of chief engineer officers and second engineer officers on ships powered by main propulsion machinery of 3,000 kW propulsion power or more.
STCW Function	Marine engineering at the management level.
STCW Competence	Maintain safety of engine equipment, systems and services.
STCW Proficiency	Operation and maintenance of auxiliary machinery, including pumping and piping systems, auxiliary boiler plant and steering gear systems. Operation, testing and maintenance of control systems.

Assessment Objectives and Methods

A qualified assessor will assess you on your ability to meet the four assessment objectives in the first column of Table D-2. The first objective will be assessed on the basis of your answers, explanations, and demonstrations in response to assessor questions. The remaining three objectives will be assessed on the basis of observation of your performance during your testing of the steering gear in accordance with the ship's operating procedures.

Table D-2. Assessment objectives and methods for testing the steering gear.

Assessment Objective	Assessment Method
1. Knowledge of steering gear testing regulation requirements.	Answers, explanations, and demonstrations in response to assessor questions.
2. Operational pretest check procedures	Practical demonstration during normal duties.
3. Testing of the internal communication systems.	
4. Testing of the steering gear systems.	

Below are some general guidelines for what you should expect during the assessment process.

Pre-Assessment Briefing with Assessor

This briefing should occur a minimum of one day before the scheduled assessment. This will help you and the assessor to be well-prepared for the assessment when it actually occurs. During this briefing, you should:

- Discuss your prior experience, training, and/or company policy with the assessor. On the basis of these qualifications, discuss whether you are qualified to undertake the steering

gear testing assessment. If you both agree you are qualified, then continue with the assessment process. If not, arrange for additional training, and set a date for another review of your qualifications.

- Review the steering gear testing assessment objectives and methods (Table D-2), and ask any questions you have about them.
- Discuss the desired outcome(s) and the consequences of failing to perform any part of the steering gear testing assessment.
- Discuss the general steering gear testing assessment procedures. Your assessor will inform you of how much time is allowed, when the assessment begins, and under what circumstances he or she will terminate the assessment.
- Consider whether you are willing to be assessed under the circumstances presented and advise the assessor of your willingness to undertake the assessment.

Participation in the Assessment

You are expected to adhere to standard procedures or company policy. During the assessment, remember to:

- Listen to an entire question before responding or acting. Remember that you may not use reference material during the assessment examination, other than copies of ship's operating procedures and standing orders.
- Ask questions if you have a safety concern. If a safety violation occurs, the assessor will terminate the assessment immediately.

To the extent practical, the assessor will ensure that your assessment is conducted under normal working conditions.

The Outcome of Your Assessment

The assessor will record your performance on a series of *Assessment Worksheets*. The assessor will score each performance measure on a "Pass/Fail" basis. Acceptable performance (a "Pass" score) will be based on your demonstrated ability to correctly respond to the questions that you are asked during the examination portions of the assessment. It will also be based on your ability to safely perform assigned tasks in a manner that demonstrates that you possess the required level of skill, knowledge, and ability, as well as sound and professional judgment.

If you receive a "Fail" score on a worksheet, or if you "Fail" any of the required performance standards, you will be asked to participate in a future reassessment, following further study or training.

Note that the following events will terminate an assessment immediately:

- An action, or lack of action, by you which required corrective action or intervention by the assessor to prevent injury, damage, or the development of a hazardous condition.
- Your failure to use proper procedures, including appropriate communication procedures, during the assessment.
- Your failure to take prompt corrective action when required.

The assessor will strictly adhere to pre-determined performance standards and scoring procedures and will document the outcome of the assessment on the *Assessment Control Sheet*.

Assessment Debriefing

The assessor should discuss the assessment results with you as soon as possible after the assessment. During the debriefing:

- ☐ The assessor should restate the assessment objective(s) and identify those that you successfully demonstrated.
- ☐ If applicable, you and the assessor should discuss the areas in which you need improvement, and then develop an improvement plan based on the steering gear testing assessment outcome.

ASSESSMENT CONTROL SHEET

Section 1. Assessment Reference Information

1. Name of Candidate	2. Name of Designated Assessor
3. Date of Assessment	4. Vessel Name and Location

Section 2. STCW Reference Information

Assessment Area	<i>Testing of the steering gear from the steering engine room.</i>
Assessment Method	Shipboard assessment.
STCW Requirement	1995 <i>STCW Code</i> , Section A-III/2 (p. 83): Mandatory minimum requirements for certification of chief engineer officers and second engineer officers on ships powered by main propulsion machinery of 3,000 kW propulsion power or more.
STCW Function	Marine engineering at the management level.
STCW Competence	Maintain safety of engine equipment, systems and services.
STCW Proficiency	Operation and maintenance of auxiliary machinery, including pumping and piping systems, auxiliary boiler plant and steering gear systems. Operation, testing and maintenance of control systems.

Section 3. Assessment Objectives and Scores

Worksheet	Assessment Objective	Assessment Methods	Score
I	1. Knowledge of Steering Gear testing regulation requirements.	Answers, explanations, and demonstrations in response to assessor questions.	☐ Pass ☐ Fail
II	2. Operational pretest check procedures.	Practical demonstration during normal duties.	☐ Pass ☐ Fail
III	3. Testing of the internal communication systems.	Practical demonstration during normal duties.	☐ Pass ☐ Fail
IV	4. Testing of the steering gear systems.	Practical demonstration during normal duties.	☐ Pass ☐ Fail
NOTE: Successful performance on the entire assessment requires a passing score on all worksheets.			Overall Assessment Result ☐ Pass ☐ Fail

Section 4. Assessment Worksheet Summary

Assessment Worksheet	Assessment Objective	Action
I	1. Knowledge of steering gear testing regulatory requirements.	1.1. Testing of steering gear in accordance with regulatory requirement CFR 33-164.25 and CFR 46-78.17-15. 1.2 Testing of steering gear in accordance with regulatory requirement CFR 46-58.25-5.
II	2. Operational pretest check procedures.	2.1 Confirms safe conditions prior to conducting test. 2.2 Visually inspects equipment prior to testing.
III	3. Test of internal communication systems.	3.1 Tests of all internal communication systems between the steering gear, engine room, and bridge. 3.2 Tests engine control room internal communication equipment.
IV	4. Testing of steering gear systems.	4.1 Tests the Emergency Rudder Positioning System. 4.2 Tests the standby steering gear. 4.3 Tests the maneuvering steering gear. 4.4 Records the results of the steering gear test in the engine logbook.

ASSESSMENT WORKSHEET I

Section 1. Assessment Conditions

Assessment Objective	1. Knowledge of steering gear testing regulatory requirements.
Assessment Method	Answers, explanations, and demonstrations in response to assessor questions.
Candidate Orientation	The candidate should be highly familiar with the regulations pertaining to the testing of the steering gear. One candidate will be assessed at a time. The candidate will be questioned about his/her knowledge of the applicable regulations.
Required Equipment, Apparatus, and/or Tools	The assessment should be conducted in a comfortable area where the candidate can write with pen and paper if a written assessment is given.
Initial Conditions	The assessment should be in a relatively quiet area with minimal distractions, where the candidate can answer questions regarding the regulations pertaining to the testing of the steering gear. The candidate should not be helped by others. This assessment can be written or verbal.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Action*, *Performance Measure*, or *Performance Standard* was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
1.1 Testing of steering gear in accordance with regulatory requirement CFR 33-164.25, CFR 46-78.17-15.	Answers question: <i>What systems must be tested to comply with regulatory requirements for testing the steering gear?</i>	Correctly identifies each of the following systems: ☐ Primary steering gear systems. ☐ Secondary steering gear system. ☐ Control and alarm systems. ☐ Internal communication systems.	☐ Pass ☐ Fail
	Answers question: <i>During a typical voyage, when must the steering gear test be conducted to comply with regulatory requirements?</i>	Correctly identifies each of the following requirements: ☐ Within 12 hours of departing. ☐ Within 12 hours of arriving port.	☐ Pass ☐ Fail
	Answers question: <i>During an extended voyage, how often must the steering gear test be conducted to comply with regulatory requirements?</i>	Correctly identifies the requirement to test the steering gear once per week at sea.	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
1.2 Testing of steering gear in accordance with regulatory requirement CFR 46-58.25-5.	Answers question: <i>What are the rudder test procedures for the auxiliary steering gear, in terms of:</i> • Ship's speed. • Degree of rudder swing.	Correctly identifies each of the following requirements: ☐ Test while running ahead at ahead half or 7 knots, whichever is greater. ☐ Test rudder from 15 degrees left to 15 degrees right.	☐ Pass ☐ Fail
	Answers question: <i>What are the rudder test procedures for the main steering gears, in terms of:</i> • Ship's speed.	Correctly identifies requirement: ☐ Test while running ahead at maximum continuous rated shaft RPM.	☐ Pass ☐ Fail ☐ N/A
	Answers question: <i>What are the rudder test procedures for the main steering gears, in terms of:</i> • Degree of rudder swing.	Correctly identifies requirement: ☐ Test rudder from 35 degrees left to 35 degrees right.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet I Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSMENT WORKSHEET II

Section 1. Assessment Parameters

Assessment Objective	2. Operational pretest check procedures.
Assessment Method	Practical shipboard demonstration by the candidate.
Candidate Orientation	The candidate should be highly familiar with the steering gear arrangements and systems. One candidate will be assessed at a time. The assessor will be observing the candidate directly during the assessment. This assessment is a demonstration of the candidate's knowledge and ability to do a thorough inspection. It is very important for the candidate to communicate to the assessor what he/she is inspecting, the reason why, condition found, faults detected, and how the faults were corrected.
Required Equipment, Apparatus, and/or Tools	The candidate should begin the assessment in the local engine control room where he or she can be briefed as to the condition of the steering gears and the availability of people to assist him/her. The candidate will be working around the steering gears in the steering engine room and will require the appropriate personal safety equipment as dictated by the vessel and company.
Initial Condition	The plant will be in normal operation; the vessel should be at dock, at anchor, or at a position at sea to safely test the steering gear. The main steering gear is lined up and secured. The auxiliary steering gear is secured but ready to be used. All support systems are lined up and operational.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Action*, *Performance Measure*, or *Performance Standard* was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
2.1 Confirms safe conditions prior to conducting test.	Establishes communication with bridge and confirms it is safe to test steering gear.	Receives confirmation that testing the steering gear will not adversely affect the operation of the vessel.	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
2.2 Visually inspects equipment prior to testing.	Inspects steering gear hydraulic equipment.	Visually inspects the hydraulic equipment for:	
		• Proper hydraulic fluid and level.	☐ Pass ☐ Fail
		• Condition and temperature of fluid.	☐ Pass ☐ Fail ☐ N/A
		• Condition of hoses and fittings for signs of deterioration or leaks.	☐ Pass ☐ Fail
		• Filter assemblies for leaks or fouling.	☐ Pass ☐ Fail
		• Proper oil levels in gears, bearings, grease in cups, and auto greasing equipment.	☐ Pass ☐ Fail ☐ N/A
		• Inspects all linkages for proper pins, cotter pins tight, jam nuts, good mechanical joints and connections.	☐ Pass ☐ Fail
		• Inspects solenoids for secure attachment and electrical connections.	☐ Pass ☐ Fail
	Visually inspects control panels and monitors.	Inspects steering gear electric controller and alarm panels for:	
		• Power to controllers and alarm panels.	☐ Pass ☐ Fail
		• Test of indicator lights and horn.	☐ Pass ☐ Fail ☐ N/A
		• Test of loss of power by shutting off power to controller and verifying alarm sounds locally, on bridge, and in engine room.	☐ Pass ☐ Fail
		• Restore power and verify loss of steering gear alarms locally, on bridge and engine room.	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
2.2 Visually inspects equipment prior to testing.	Visually inspects rudder position and control follow up equipment.	Inspects the rudder position and follow-up equipment:	
		Control linkages and arms are properly secured, and will not come loose or apart, by inspecting connections and joints for defective pins, cotter pins or fastening clips.	☐ Pass ☐ Fail
		Rudder indicator pointer and degree markings are properly secured and readable.	☐ Pass ☐ Fail
		Rudder indicator agrees with indicators on the bridge, and other remote locations.	☐ Pass ☐ Fail ☐ N/A
		Rudder grounding strap is properly grounded to hull.	☐ Pass ☐ Fail
		Inspect TV camera for secure mounting, and monitors and controls in remote locations are working (if applicable).	☐ Pass ☐ Fail ☐ N/A

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet II Pass/Fail status:		
Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.)		☐ Pass
Check Fail IF Measures Passed is LESS than Measures Total .		☐ Fail
Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet II Pass/Fail score to the <i>Assessment Control Sheet</i> .		

ASSESSMENT WORKSHEET III

Section 1. Assessment Parameters

Assessment Objective	3. Testing of the internal communication systems.
Assessment Method	Practical shipboard demonstration.
Candidate Orientation	See Assessment Worksheet II.
Required Equipment, Apparatus, and/or Tools	See Assessment Worksheet II.
Initial Condition	See Assessment Worksheet II.

Section 2. Actions, Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Action*, *Performance Measure*, or *Performance Standard* was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
3.1 Tests all internal communication systems between the steering gear, engine room, and bridge.	Tests the sound-powered telephones.	Checks each sound-powered telephone system in the steering gear, bridge, and engine control room.	☐ Pass ☐ Fail ☐ N/A
	Tests the internal dial phones.	Checks the dial telephone system in the steering gear, bridge, and engine control room.	☐ Pass ☐ Fail ☐ N/A
	Tests the wireless communication systems.	Checks the radio system and verifies which channel the bridge will be operating on during maneuvering.	☐ Pass ☐ Fail ☐ N/A
		Checks the radio system and verifies that the base stations can transmit and receive between each other.	☐ Pass ☐ Fail ☐ N/A
	Tests the gyro and gyro repeaters.	Verifies that the course heading on the gyro repeater in steering gear matches the gyro and gyro repeaters on the bridge.	☐ Pass ☐ Fail ☐ N/A

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
3.2 Tests the engine control room internal communication equipment.	Checks the settings of clocks or bell recorders.	Verifies that the proper time is set on engine control room clocks and they agree with the bridge.	☐ Pass ☐ Fail
		Verifies that the proper time and date on bell recorder.	☐ Pass ☐ Fail ☐ N/A
	Tests the telegraph.	Verifies that the bells orders are identical between the bridge and engine room for all speed changes.	☐ Pass ☐ Fail
		Verifies that the telegraph rings when speed changes are made when applicable.	☐ Pass ☐ Fail
	Tests the PA system.	Verifies that the PA system works both ways.	☐ Pass ☐ Fail
			☐ N/A

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet III Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet III Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSMENT WORKSHEET IV

Section 1. Assessment Parameters

Assessment Objective	4. Testing of the steering gear systems.
Assessment Method	Practical shipboard demonstration.
Candidate Orientation	See Assessment Worksheet II.
Required Equipment, Apparatus, and/or Tools	See Assessment Worksheet II.
Initial Condition	See Assessment Worksheet II.

Section 2. Performance Measures, Standards, and Scores

NOTE: Every row corresponding to an *Action*, *Performance Measure*, and *Performance Standard* in the following table should have one *Score* checked at the completion of the assessment.

Pass Indicates that the *Performance Standard* was met.

Fail Indicates that the *Performance Standard* was not met.

N/A Indicates that the *Action*, *Performance Measure*, or *Performance Standard* was not applicable, due to a lack of available equipment or conditions, or due to conflicting operating procedures.

Action	Performance Measure	Performance Standard	Score
4.1 Tests the Emergency Rudder Positioning System.(ERPS)	Demonstrates lining up the ERPS system, testing and relining up the main steering gear system.	Follow the procedures below during the testing of the ERPS System:	☐ Pass
		• Notifies bridge that the ERPS system is going to be tested.	☐ Fail
			☐ N/A
		• Notifies bridge that no main steering gears are to be started and they will be notified when main system is back to normal.	☐ Pass
			☐ Fail
			☐ N/A
		• Properly lines up the valves to the system.	☐ Pass
			☐ Fail
			☐ N/A
		• Verifies that system has proper fluid and level.	☐ Pass
			☐ Fail
			☐ N/A
		• Starts system and verifies proper response port and starboard rudder movements; looks for leaks and listens for unusual noises. Return to midship when done.	☐ Pass
			☐ Fail
			☐ N/A
		• Relines up main steering gear system, making sure valves are pinned or locked in the normal running position.	☐ Pass
			☐ Fail
		Notifies bridge that system is back to normal.	☐ N/A

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
	Answers question: <i>At what speed is it appropriate to test this ERPS system?</i>	Identifies appropriate speed for this vessel.	☐ Pass ☐ Fail ☐ N/A
4.2 Tests standby steering gear.	Tests local controls and operation.	Checks the following during the local control test:	☐ Pass ☐ Fail ☐ N/A
		• Bridge is notified.	☐ Pass ☐ Fail
		• Local controls work.	☐ Pass ☐ Fail
		• Check for hydraulic leaks on all piping and components during operation.	☐ Pass ☐ Fail
		• Check for rudder response, in both follow up and non-follow up modes as applicable.	☐ Pass ☐ Fail
		• Look, listen and feel the motor and hydraulic pumps for abnormal conditions.	☐ Pass ☐ Fail
		• Check hydraulic system and control pressure where applicable.	☐ Pass ☐ Fail ☐ N/A
	Tests standby unit for remote control and operation.	Checks the following during the remote control test:	☐ Pass ☐ Fail
		• Transfer of control to the Bridge.	☐ Pass ☐ Fail
		• Starting and stopping of the unit remotely.	☐ Pass ☐ Fail
		• Visual inspection of all control linkages and follow-up linkages while operating for faulty joints or connections.	☐ Pass ☐ Fail
		• States that the requirement is 28 seconds or less (cf CFR 46).	☐ Pass ☐ Fail ☐ N/A
4.3 Tests the maneuvering steering gear.	Tests the maneuvering unit for local control and operation.	Checks the following during the remote control test:	☐ Pass ☐ Fail
		• Bridge is notified.	☐ Pass ☐ Fail
		• Local controls work.	☐ Pass ☐ Fail
		• Check for hydraulic leaks on all piping and components during operation.	☐ Pass ☐ Fail

Section 2. Actions, Performance Measures, Standards, and Scores (Continued)

Action	Performance Measure	Performance Standard	Score
4.3 Tests the maneuvering steering gear. (Continued)	Tests the maneuvering unit for local control and operation. (Continued)	Check for rudder response, in both follow up and non-follow up modes as applicable.	☐ Pass ☐ Fail
		Look, listen and feel the motor and hydraulic pumps for abnormal conditions.	☐ Pass ☐ Fail
		Check hydraulic system and control pressure where applicable.	☐ Pass ☐ Fail ☐ N/A
	Test of the maneuvering unit for remote control and operation.	Check the following during the remote control test: Transfer of control to the bridge.	☐ Pass ☐ Fail
		Starting and stopping of the unit remotely.	☐ Pass ☐ Fail
		Visual inspection of all control linkages and follow-up linkages while operating for faulty joints or connections.	☐ Pass ☐ Fail
4.4 Records the results of the steering gear test in the engine logbook.	Answers question: <i>What are the engine logbook entries that are required by regulation following the completing of testing?</i>	Correctly identifies the following requirements: What was tested, or steering gear tested as per CFR 33-164.25.	☐ Pass ☐ Fail
		Time steering gear was tested.	☐ Pass ☐ Fail
		Condition of steering gear.	☐ Pass ☐ Fail
		Initials of officer testing steering gear.	☐ Pass ☐ Fail

Section 3. Worksheet Scoring Procedure

Count the number of measures on the worksheet that have a Pass score:	Measures Passed	
Count the total number of measures scored, including both Pass and Fail:	Measures Total	
Determine Worksheet IV Pass/Fail status: Check Pass IF Measures Passed EQUALS Measures Total (i.e., ALL measures received a passing grade.) Check Fail IF Measures Passed is LESS than Measures Total . Transfer the final Worksheet I Pass/Fail score to the <i>Assessment Control Sheet</i> . Transfer the final Worksheet IV Pass/Fail score to the <i>Assessment Control Sheet</i> .		☐ Pass ☐ Fail

ASSESSOR COMMENTS

This page is provided for assessors to record their observations and comments regarding assessment conditions or limitations that may have affected the validity or reliability of the assessment outcome.

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