
Developing Mariner Assessments:

A Practical Workshop for Assessment Developers

Workshop Staff Introductions

Participant Introductions

Please tell us briefly:

- Your name
- How you are related to the maritime industry
- What you most want to gain from the course

Project Context

- USCG and industry, increased concern for mariner proficiency in performing shipboard responsibilities
- Project objective to assist USCG and industry by providing tool for assessment
- Considered instructional theory, recent USCG guidance, 1995 IMO STCW amendments

Instructional Theory

- For training, performance-based objectives: conditions, behaviors, standards (as example: IMO model courses)
- For assessment, recent practice:
 - expert judgment of skills, valid
 - paper test of knowledge, reliable
- Develop performance-based assessment procedures, valid and reliable

Recent USCG Guidance

- On company roles and responsibilities regarding STCW (NVIC 4-97)
- On Qualified Instructors and Designated Examiners (NVIC 6-97)
- On USCG/industry partnerships through a Quality Standards System for workshops and training programs (NVIC 7-97)

1995 IMO STCW Amendment

- Requires assessment of mariner competence by demonstration of performance
- Provides required proficiencies, understanding, skills by mariner role
- Provides guidance on assessment methods: shipboard, simulator, laboratory
- Provides guidance on assessor, on using established measures and standards

IMO MSC Circular, May 1998

- Formal assessment of **competence** under authority of approved center
- Conduct of assessment of **proficiencies** by qualified assessor onboard ship
- **Guidance for developing and conducting assessments (similar to project approach)**

Workshop Scope and Audience

- Scope: Tool for developing procedures for assessment of mariner proficiencies
- Audience
 - USCG reviewers
 - USCG-accepted third-party reviewers
 - Training program assessment developers
 - Qualified instructors and designated examiners

NOTE: This workshop does not now meet any IMO, STCW, or USCG requirements.

Workshop Objectives

- Understand validity and reliability
- Demonstrate development of performance-based assessment objectives
- Demonstrate specification of methods, conditions, and exercises
- Understand performance measurement
- Demonstrate development of standards
- Demonstrate preparation of materials

Developing Procedures for Assessment of Mariner Proficiency

Workshop Agenda

Day 1

- The Assessment Development Process
 - Assessment Validity and Reliability
- Step 1: Identify Assessment Objectives
- Step 2: Determine Assessment Methods



Workshop Agenda

Day 2

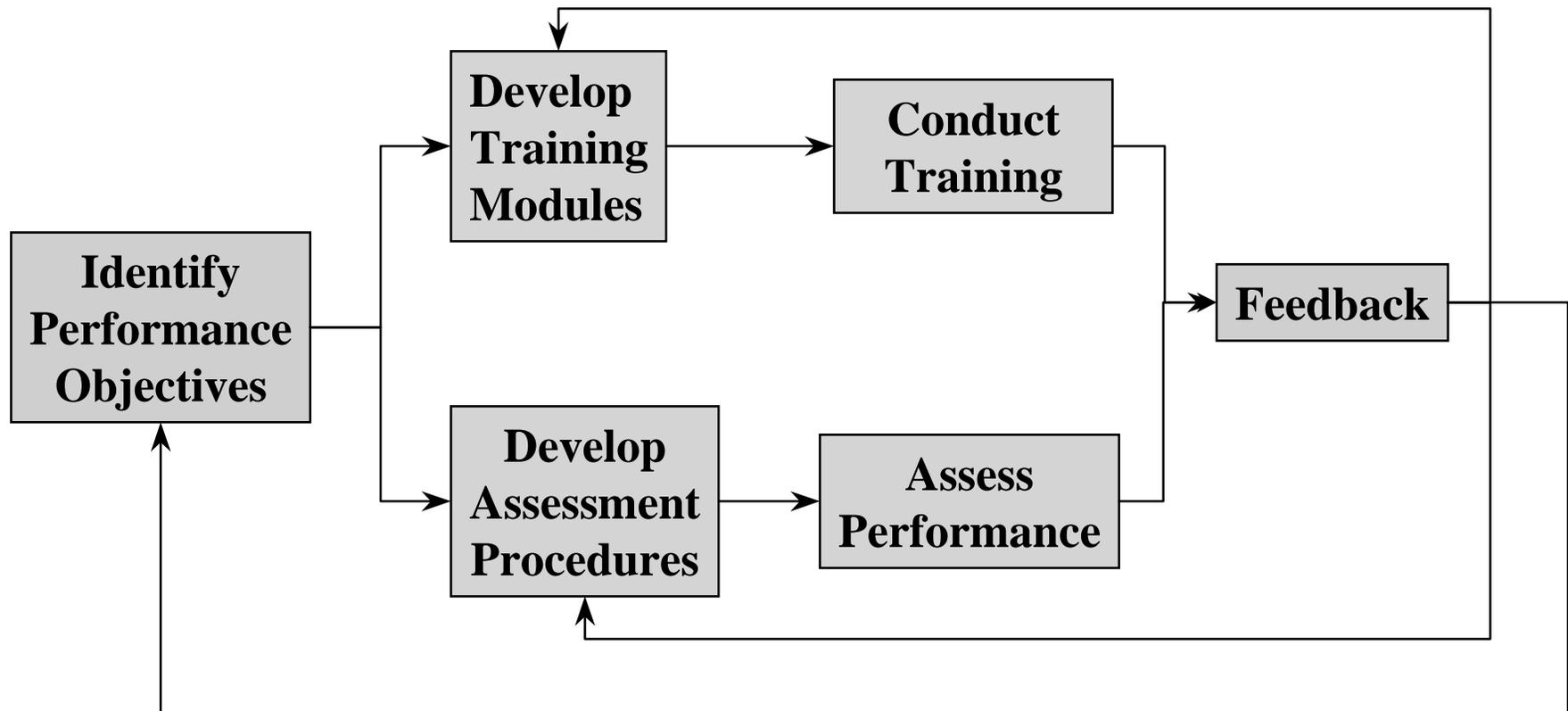
Step 3: Specify Assessment Conditions

Step 4: Develop Performance Measures and Standards

Step 5: Prepare Assessment Materials

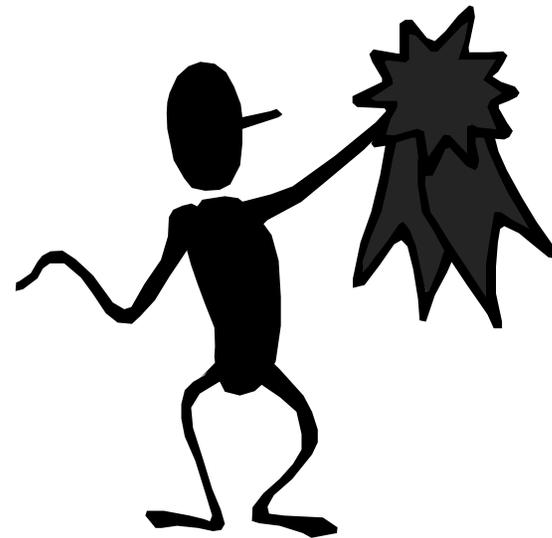
Summary/Overview

Instructional Development and Assessment Development

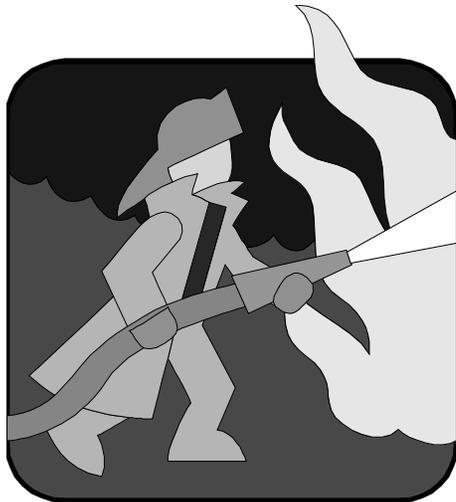


Common Uses of Assessment

- Equipment purchases
- Judging animals in competitions
- Comparing athletic performances
- Evaluating the performance of employees



Assessment Success Stories



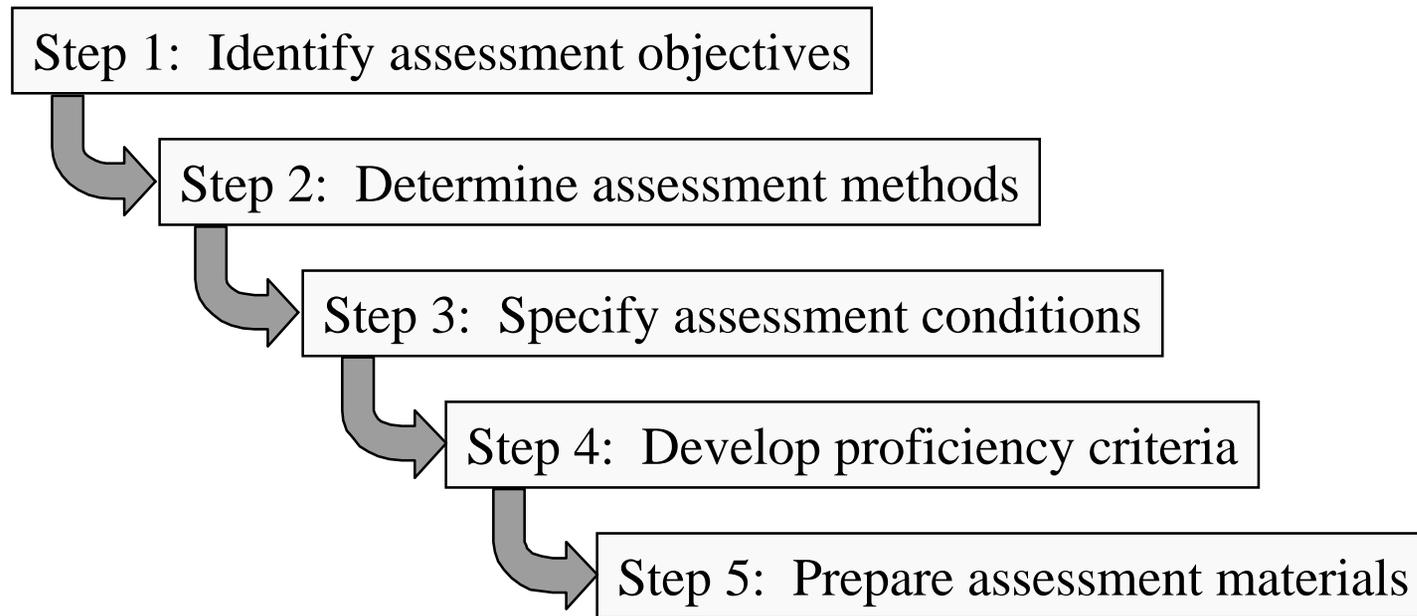
- Telecommunications industry
- Pilot training
- Fire fighting
- Tank crew training

Example of Employee Assessment

Hamburger Heaven Food Server

Assessment Objective	Performance Standard
Friendly and courteous	Smiles and greets every customer
Speedy service	More than 40 orders per hour
Accurate charging	Less than 1% errors
Accurate order filling	Less than 10% errors

Five Steps of Assessment Development



Validity and Reliability of Mariner Assessments

Validity

- Validity refers to the idea of assessing the performance of interest
- *Example:*
 - *Head diameter as an assessment of intelligence has low validity*
 - *Head diameter as an assessment of a mariner's ability to get his/her head in and out of a port hole has high validity*

Valid Assessments

- Include the work equipment (controls, displays, tools) that are required for successful performance
- Provide the cues from the job environment that are used on the job to determine appropriate actions
- Assess skills and knowledge that are critical to successful performance

Case Study: Rules of the Road

Three Assessment Methods

Assessment Method	Description
Multiple-choice test items	Third mate licensing exam items
Situation Assessment	View dynamic simulated situation and determine Rules applicability
Collision Avoidance	Take action on simulated bridge to avoid potential collisions

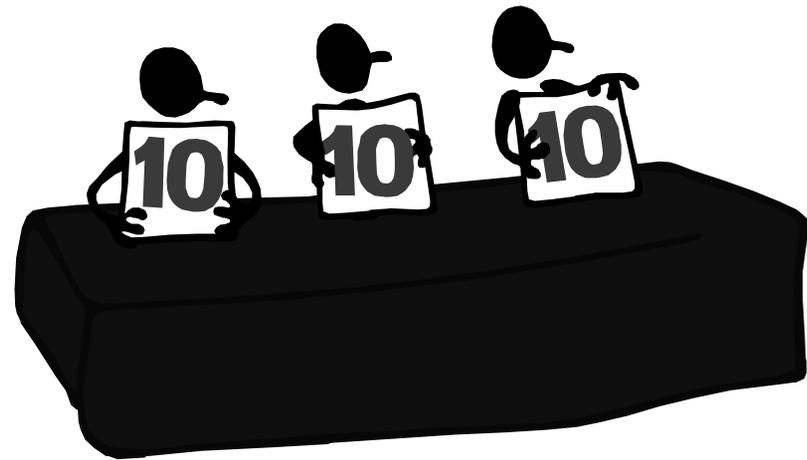
Case Study: Rules of the Road

Assessment Method	Validity Issues
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Multiple-choice test items	Positive: Covers broad range of topics Negative: Test items can be memorized. Assesses recall of information, not application
Situation Assessment	Positive: More directly resembles bridge watchkeeping requirements Negative: Does not assess collision avoidance
Collision Avoidance	Positive: Resembles additional bridge watchkeeping requirements Negative: Does not assess application of Rules on a real bridge

Reliability

- Reliability refers to the consistency of assessment



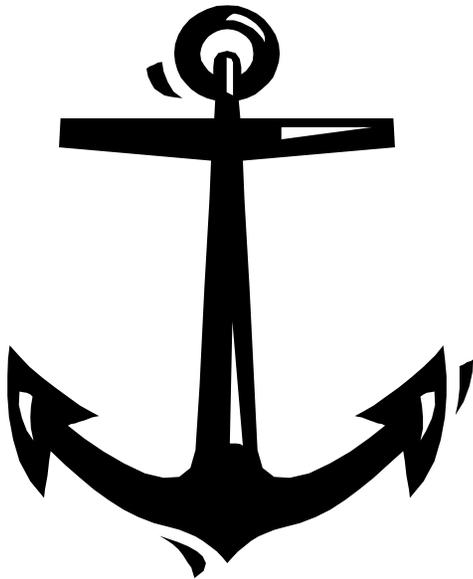
Reliable Assessments

- Consist of procedures that are easily repeated between assessments and assessors
- Have well-defined performance measures
- Have well-defined procedures for comparing performance to standards

Case Study: Rules of the Road

Assessment Method	Reliability Issues
Multiple-choice Items	Positive: Items are repeated, minimal assessor involvement, well-defined scoring Negative: May be misinterpreted
Situation Assessment	Positive: Scenario is repeated, minimal assessor involvement, well-defined scoring Negative: Limited number of scenarios, artificial setting may make interpretation difficult
Collision Avoidance	Positive: Scenarios always start the same Negative: Scenarios vary with maneuvers, well-defined scoring is difficult (but feasible)

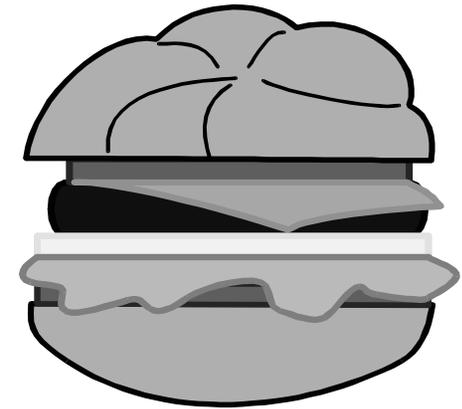
Validity and Reliability of Mariner Assessment



- Are valid and reliable assessment procedures a practical goal in the maritime industry?
- What are the main obstacles to valid and reliable assessment of mariners?
- How can we best address these obstacles?

Exercise 1: Understanding Assessment Validity and Reliability

- Hamburger Heaven Server Training and Assessment
 - Candidates receive a full day of training at Hamburger Limbo.
 - Candidates must successfully complete Hamburger Limbo assessment in order to advance to a probationary position at Hamburger Heaven.



Exercise 1, continued

The first four hours at Hamburger Limbo is a series of lectures addressing:

- Hamburger Heaven mission and vision
- Hamburger Heaven profit goals
- Worker safety
- Server's attire and hygiene requirements
- Four standards of Hamburger Heaven server performance

Exercise 1, continued

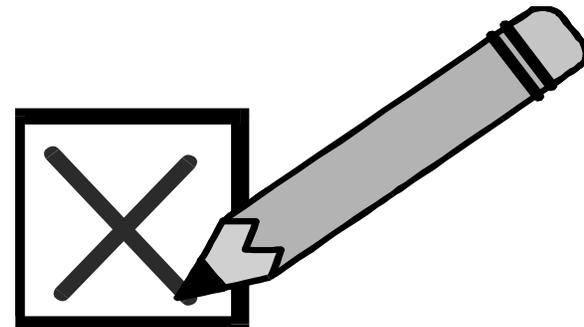
The four standards of Hamburger Heaven server performance are:

- Smile and greet every customer
- 40+ orders taken per hour
- Less than 1% charging errors
- Less than 10% order filling errors

Exercise 1, continued

The final four hours in Hamburger Limbo is a four-part assessment:

1. Computer administered multiple-choice test
2. Greeting assessment
3. Order taking assessment
4. Order filling assessment



Exercise 1, continued

- We will assist in forming small work groups
- Each group should review the four assessment procedures and provide comments and recommendations on:
 - Positive & negative validity issues
 - Positive & negative reliability issues
 - Recommended assessment procedure improvements for validity and reliability

Exercise 1: Example Solution

Step 1: Specify Assessment Objectives

Steps in Specifying Assessment Objectives

1. Select proficiency to be assessed
2. Identify regulatory requirements
3. Analyze job requirements
4. Describe individual assessment objectives

Identify Regulatory Requirements

- Identify specific requirement in STCW code
- 5 levels of requirements in STCW code:
 - Chapter
 - Table
 - Function
 - Competence
 - Proficiency

STCW Code



Competencies: Function onboard ship

Knowledge, Understanding, Proficiency: Specific skill and knowledge requirements

Analyze Job Requirements

- Identify job requirements using available sources
- Document sources
- Identify critical job requirements
- Make sure the assessment procedure meets STCW requirements and is practically feasible

Sources of Mariner Task Information

- STCW competencies, knowledge, understanding, and proficiency
- U.S. Code of Federal Regulations
- Job or task analysis
- Subject matter expert knowledge and judgment
- Technical manuals
- Bargaining agreements

Job or Task Analysis

Job Description: General responsibilities and duties

Task Description: Specific activities with identifiable beginning, action, output

Task Criticality: Identification of tasks critical to successful job performance

- Frequency
- Importance

Collection of Job/Task Data

1. Determine the job to be analyzed
2. Prepare the data collection plan
3. Gather initial data
4. Prepare data collection forms
5. Select sample and arrange data collection
6. Collect data
7. Consolidate data into lists of tasks with criticality
8. Validate task list and determine skill and knowledge requirements
9. Finalize list



Subject Matter Experts (SMEs)

- Provide initial input in task analysis
- Provide a substitute or shortcut to formal task analysis
- SME sources
 - Current jobholders
 - Supervisors
 - Instructors
 - Former jobholders
 - Others familiar with job

Describe Individual Assessment Objectives

- State individual objectives
- Describe assessment conditions
- Identify special characteristics
- Describe mariner actions

Assessment Objectives . . .

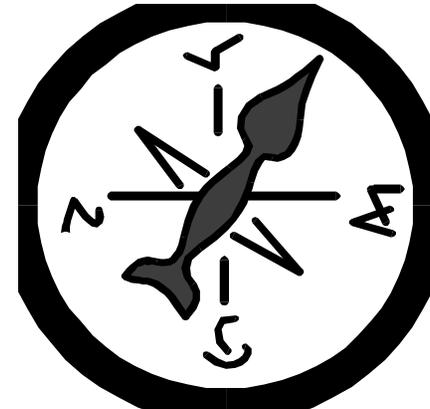
- May address either:
 - *Skills & abilities*: behaviors that must be applied in successful performance of job activities
 - *Knowledge*: learned concepts, cues, facts, rules, & procedures that are necessary for proficient performance of a task
- Should address critical job requirements
- Should address prerequisite training and experience

Standard Format for Objectives

- Assessment objectives should describe what the mariner needs to perform to successfully complete the assessment
- When writing assessment objectives, make sure you capture:
 - action
 - preliminary conditions
 - preliminary standard(s)

Example Objective: ARPA

Using ARPA under conditions of relatively complex and varied traffic conditions, calculate required new course for vessel to maintain a minimum CPA between own ship and other vessels.



Example Objective: Performance of Lookout Procedures

Specification from 1995 *STCW Code*:

STCW Table A-II/4: 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

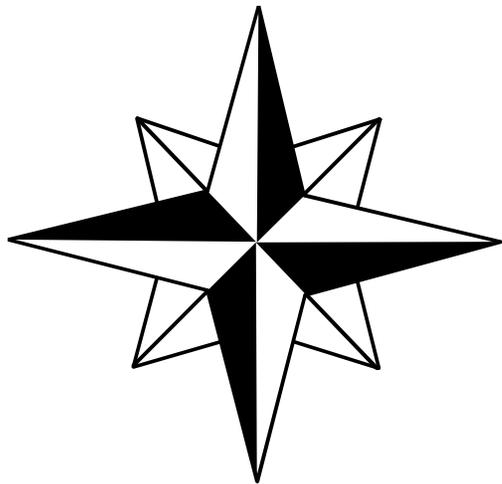
Assessment Objectives for Lookout Procedures

1. Describe lookout duties & responsibilities
2. Identify lookout stations & safe routes onboard
3. Describe & identify international distress signals
4. Demonstrate lookout techniques & make lookout reports in clear visibility during daylight
5. Demonstrate lookout techniques & make lookout reports in clear visibility at night

Assessment Objectives for Lookout Procedures (continued)

6. Demonstrate lookout techniques & make lookout reports in restricted visibility during daylight or at night
7. Demonstrate the use of lookout equipment
8. Demonstrate man overboard procedures
9. Demonstrate lookout watch relief procedures

Comparison of Simulator and Shipboard Assessment



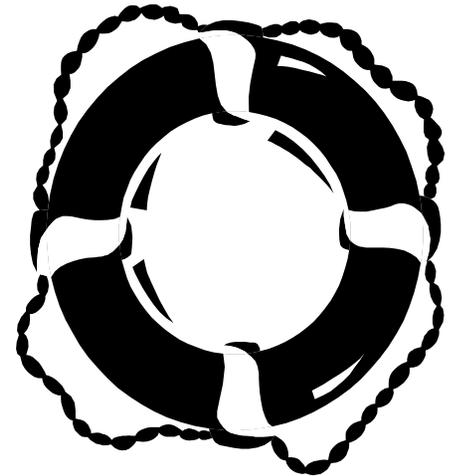
- How would you need to identify assessment objectives differently if you were assessing via simulation and shipboard assessment?
 - ARPA example
 - Lookout Procedures example

Exercise 2: Specifying Assessment Objectives

- **Goal:** To specify six lifeboat launching assessment objectives
- **Tools:**
 - STCW and CFR Lifeboat Competencies
 - Lifeboat Launching Procedure
 - Examples:
 - Lookout Procedures
 - ARPA
 - Assessment Objectives Worksheet

Exercise 2, continued

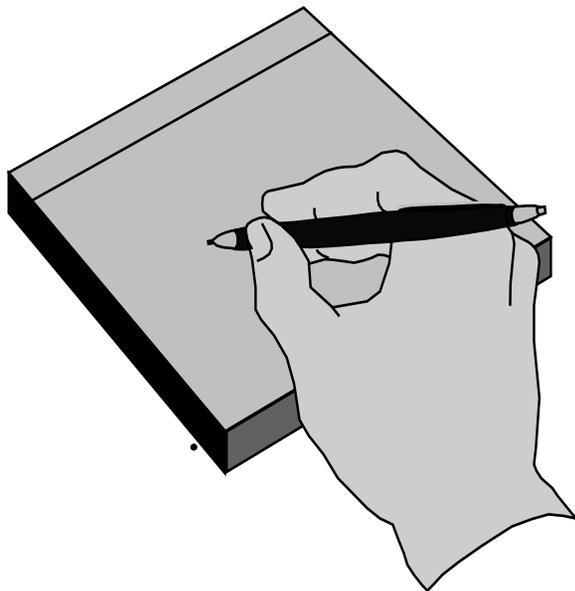
- To get started:
 - Review the STCW/CFR competencies
 - Review the lifeboat task data
 - Use the above & your knowledge of best practices as the basis for your objectives
 - Use the Lookout and ARPA examples as a guide for the format of your objectives



Exercise 2, continued

- Your assessment objectives should include:
 - Action
 - Preliminary conditions
 - Preliminary standard(s)
- Example:
 - Given relatively complex and varied traffic (*condition*), using ARPA calculate the required new course for own ship (*action*) to maintain a minimum CPA between own ship and other vessels (*standard*).

Exercise 2, continued



- Use the overhead transparency worksheet to record your group's answers.
- Select a spokesperson to tell the larger group your assessment objectives.
- You have 30 minutes for this exercise

Exercise 2: Example Solution

- Many correct responses
- Solution gives example of 6 possible objectives
- Example objective:
 - Given a stowed lifeboat and 4 cadets (*conditions*), person in charge uses proper commands and terminology (*standard*) to carry out inspections of lifeboat, falls and davit (*action*).

Step 2: Determine Assessment Methods

Steps in Determining Assessment Methods

1. Identify alternative assessment methods
2. Review advantages, disadvantages, and feasibility of alternatives
3. Consider performance to be assessed and review validity and reliability issues
4. Determine assessment method

Basic Assessment Methods

- Written or oral test questions
- Simulation using mock equipment
- Simulation using actual equipment
- Shipboard assessments

Written or Oral Test Questions



- Open-ended
- Fill-in the blank
- Multiple-choice
- Essay/discussion

Characteristics of Simulation

- Environment
- Controls
- Displays
- Processing Characteristics
 - Hydrodynamics
 - Mimicry of electronic processing

Shipboard Assessment

- Actual or dedicated training/assessment equipment
- Operational or non-operational conditions
- More/less demanding operational conditions

Pros and Cons of Assessment Methods

Assessment Method	Pros	Cons
Written or oral test questions	<ul style="list-style-type: none"> • Easy to create • Easy to standardize • Easy to test many candidates • Good for measuring knowledge 	<ul style="list-style-type: none"> • May have poor similarity to work environment • Candidate needs good verbal skills
Simulation using mock equipment	<ul style="list-style-type: none"> • High control • Safe 	<ul style="list-style-type: none"> • May be expensive • May have poor work similarity • Substantial assessor requirements
Simulation using actual equipment	<ul style="list-style-type: none"> • High control • Safe • May have good work similarity 	<ul style="list-style-type: none"> • May be expensive • Substantial assessor requirements
Shipboard	<ul style="list-style-type: none"> • May be inexpensive • Uses actual work setting 	<ul style="list-style-type: none"> • Substantial assessor requirements • Operational scheduling conflicts • Difficult to standardize and score • Task may be infrequent or dangerous

Consider Performance to be Assessed

- Review assessment objectives
- Consider task initiation
- Consider the performance product
- Consider the performance process

Review Validity and Reliability Issues

- Review realism (validity) requirements
 - Environment/setting
 - Controls
 - Displays
 - Processing Characteristics
- Review control (reliability) required
 - Key skill and knowledge requirements
 - Variability of task conditions
 - Comparability of assessment conditions

Review Feasibility of Alternatives

- Can performance be measured via written assessment?
- Can performance be easily and safely elicited onboard?
- Can a simulator replicate conditions closely enough to cue the behavior?
- Which is easier, cheaper, safer, more legally defensible?

Assessment Method Example: Rules of the Road

**Rules
Knowledge**



**Prepared Written
Questions**

**Situation
Assessment**



**Mock Equipment -- Highly
Controlled View of
Simulated Traffic**

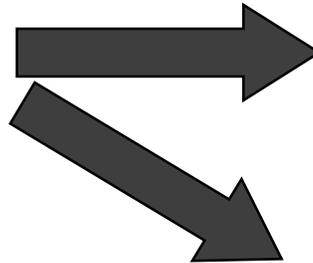
**Collision
Avoidance**



**Mock Equipment -- Control of
Vessel in Moderately
Controlled Simulated Traffic**

Assessment Method Example: ARPA Operation

**Knowledge of
Processing
Capabilities**



**Prepared Written
Questions**

**Set-up, Situation
Assessment,
Parallel Indexing,
Warnings and Tests**



**Actual Equipment in Lab --
Highly Controlled View of
Simulated Traffic**

Collision Avoidance



**Actual Equipment in Lab --
Control of Vessel in Moderately
Controlled Simulated Traffic**

Assessment Method Example: Lookout Procedures

- Assessment Requirements
 - Knowledge of lookout duties & procedures
 - Correct use and operation of lookout techniques, reporting, & equipment
- Assessment Constraints
 - Must not interfere with vessel safety
 - Equipment must be present & operational
 - Conditions of clear (day, night) & restricted visibility
- Assessment Method Selection
 - Written test to assess knowledge of duties
 - Shipboard or simulator assessment of operations

Exercise 3: Determining Assessment Methods

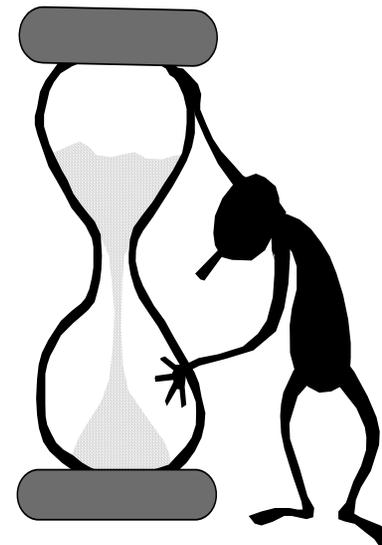
- **Goal:** To determine the appropriate assessment methods for six lifeboat launching assessment objectives
- **Tools:**
 - “Pros and Cons of Basic Assessment Methods”
 - Lookout Procedures example
 - Assessment methods worksheet

Exercise 3, continued

- To get started:
 - Remember the basic assessment methods:
 - Written or oral tests
 - Simulation in controlled lab using mock equipment (e.g., PC-based interface)
 - Simulation in controlled lab using actual equipment
 - Shipboard assessment
 - Review the pros and cons of each method (Attachment 1)

Exercise 3, continued

- Record your group's answers on your overhead transparency worksheet
- Select a spokesperson to report your assessment methods
- You have 15 minutes



Exercise 3 - Summary

- Considerations in assessment method selection:
 - Appropriateness of written, knowledge-based assessment
 - Availability of actual equipment (lifeboat, davit)
 - Operational safety
 - Possibility of damaging vessel's lifesaving equipment
 - Ability to vary conditions on equipment

Step 3: Specify Assessment Conditions

Steps in Specifying Assessment Conditions

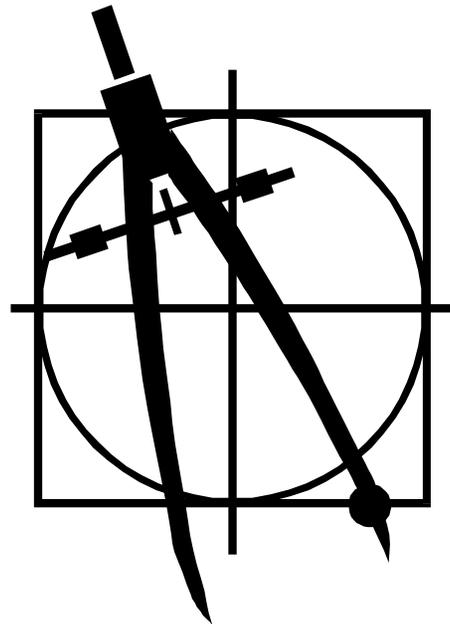
1. Describe operational settings and scenarios
2. Specify oral and written test questions
3. Provide the cues used in selecting and executing performance (validity)
4. Standardize assessment conditions (reliability)

Issues to Consider

- What must be presented to the candidate as cues to initiate task?
- What must be presented to the candidate to make decisions?
- What actions must be taken by the candidate?
- What assessment objectives will require written or oral questions?

Conditions Requiring Specification

- Candidate orientation
- Equipment, apparatus, and tools
- Initial equipment settings or scenarios
- Written or oral questions



Assessment Conditions Example: Rules of the Road

- Candidate orientation
 - 30-minute orientation of workstation operation
 - Practice session with workstation
- Equipment, apparatus, and tools
 - PC-based bridge simulator
- Initial equipment settings or scenarios
 - Situation observation scenarios (first parts)
 - Collision avoidance (second parts)
- Written or oral questions
 - Factual questions

Assessment Conditions Example: ARPA Operation

- Candidate orientation
 - ARPA set-up instructions
- Equipment, apparatus, and tools
 - Full-scale ARPA simulator
 - Vessel cards
- Initial equipment settings or scenarios
 - Situation observation scenarios (first parts)
 - Collision avoidance (second parts)
- Written or oral questions
 - Target information forms
 - Factual questions

Assessment Conditions Example:

Lookout - *Lookout Assessment Objective 4*

Assessment Objective	<i>4. Demonstrate lookout techniques and make lookout reports in clear visibility during daylight</i>
Assessment Method	Shipboard assessment and/or ship bridge simulator assessment
Candidate Orientation	Assessor briefs candidate on assessment methods, conditions, and standards
Required Equipment, Apparatus, &/or Tools	Lookout station equipped with an internal communications system, ship's bell, 7x50 binoculars, and bearing repeater fitted w/ bearing/ azimuth circle, alidade, or pelorus. The lookout station should be clear, and the examiner must be able to observe activities.
Initial Conditions	Conduct assessment in clear visibility during daylight. Ensure reportable objects are in sight.

Comparison of Simulator and Shipboard Assessment

- What are some of the challenges in controlling conditions for simulator and shipboard assessment?
 - Providing the cues used in selecting and executing performance (validity)
 - Standardizing assessment conditions (reliability)

Exercise 4: Specifying Assessment Conditions

- **Goal:** To specify conditions for your lifeboat launching assessment
- **Tools:**
 - Group responses to Exercises 2-3
 - Lookout and ARPA examples
 - Assessment conditions worksheet

Exercise 4, continued

- To get started:
 - Review the lifeboat launching assessment objective given to your group
 - Consider the preliminary conditions and method(s) you specified for this objective
 - Use the Lookout & ARPA examples as a guide
- ARPA example has:
 - Detailed exercise conditions
 - Assessor and candidate instructions

Exercise 4, continued

- ARPA Example:
 - Assumes assessment in controlled lab using full-scale functional ARPA
 - “Exercise E” is one of 7 exercises candidate performs
 - Scenario is programmed ahead of time into simulator by assessor
 - Narrow channel navigation with cross-current
 - Own ship is outbound
 - One threat vessel is inbound

Exercise 4, continued

- Candidate assessed on objective 1.6 -
“Understanding of when to use ground- or sea-stabilized modes, and when to use north- up, course-up and head-up presentations”
- Candidate given
 - full-scale ARPA simulator
 - vessel card
 - chartlet
 - exercise instructions
 - worksheet to record vessel data & response to written question

Exercise 4, continued

- Assessor given:
 - Instructions for how to program simulator
 - Instructions for how to administer assessment

Exercise 4, continued

- Record your conditions on the transparency:
 - Identify setting
 - Identify what must be presented to candidate (display)
 - Identify candidate action items
 - Identify objectives requiring questions
- Select a spokesperson
- You have 20 minutes

Exercise 4: Example Solution

- Assessment to be conducted at sea during weekly abandon ship drill
- Weather & sea conditions conducive to safe assessment
- Assessment begins with lifeboat in stowed position
- Assessor varies equipment:
 - Unfastens sea painter from thwart
 - Secures one tricing pendant incorrectly

Exercise 4: Example Solution, continued

- Assessor makes sure candidate and crew members have life jackets on
- Assessor briefs candidate on assessment objectives and standards
- Assessor has a checklist of candidate action items and standards of performance
- Assessor completes checklist as candidate performs lifeboat launching

Step 4: Develop Proficiency Criteria

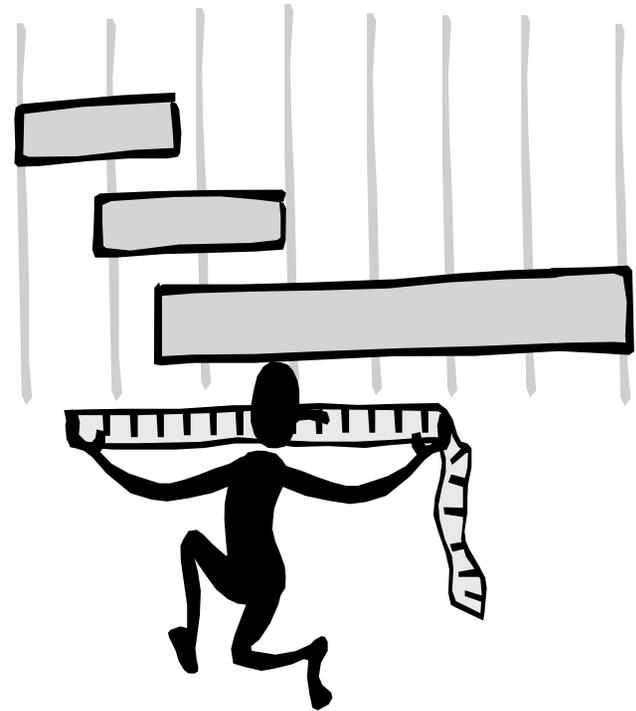
Part 1: Develop Performance Measures

Measures and Standards

Measure	Standard
Correct charging	99%
Correct order filled	90%
CPA	More than 0.25 nm
ARPA set-up time	Less than 5 minutes

Developing Performance Measures & Standards

- Match performance measures to the assessment objectives
- Refine each performance measure



Definition of Measurement

- Measurement is applying rules to assign categories or numbers to different levels or degrees
- Categories and numbers represent levels
- Rules help make categories or numbers comparable

Performance Measures

- *Performance measures* are procedures for observing and recording a candidate's performance
- Measures can be objective or subjective
- Measures can focus on the process or product of performing the task
- Try to measure the performance required to meet an objective in more than one way to increase validity and reliability

Measurement Types

Type of Measurement	Activity	Measure
Objective	Speed Skating	Time to Finish
Subjective Rating	Figure Skating	Technical & Artistic Merit
Subjective Checklist	Fast Track Racing	Finish Race or Not

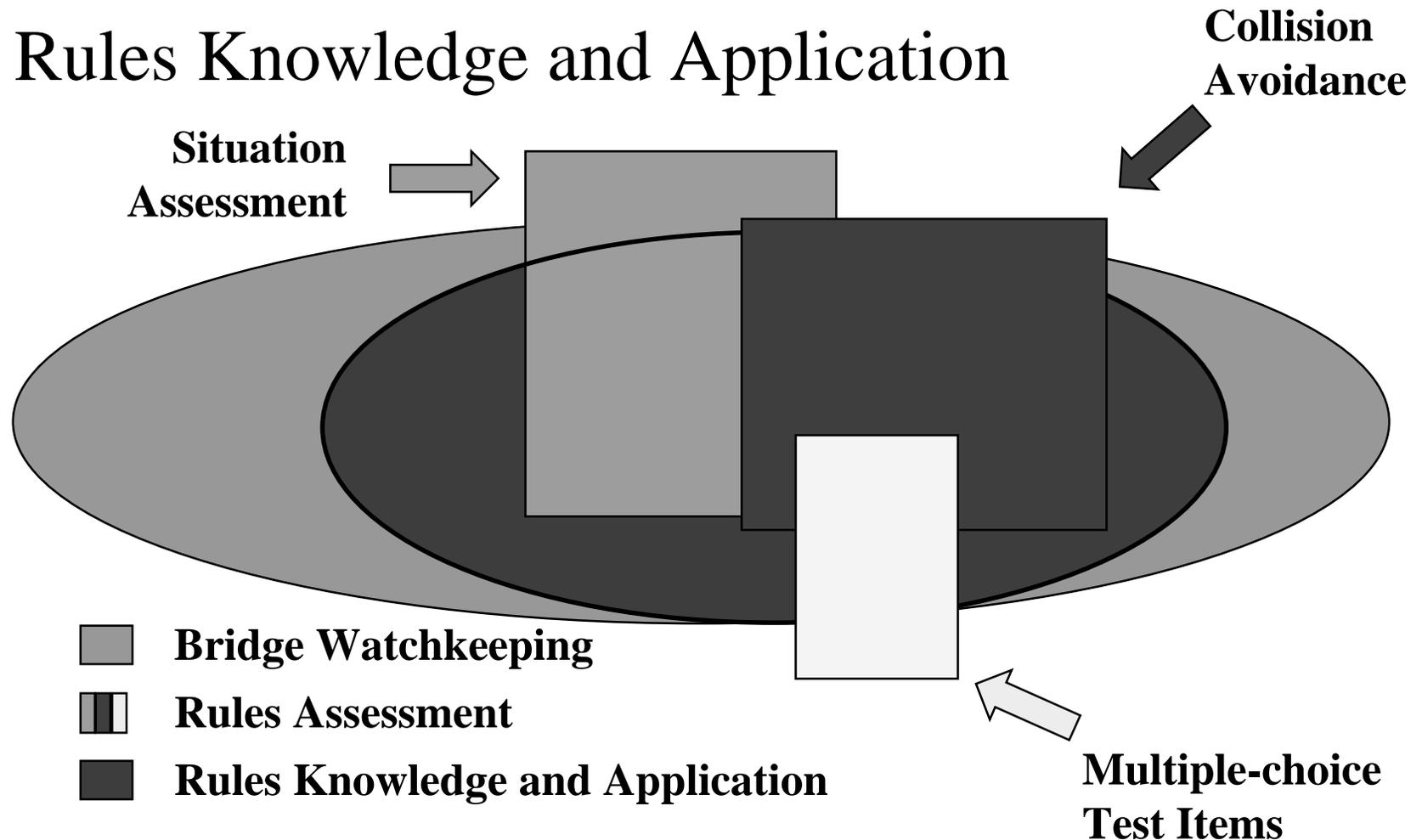
Types of Measurement

Different types of measurement give you different amounts of information

Types/Info.	Amount Different	Relative Performance	Group Member
Objective	●	●	●
Rating		●	●
Checklist			●

Measuring What You Want to Measure

Rules Knowledge and Application



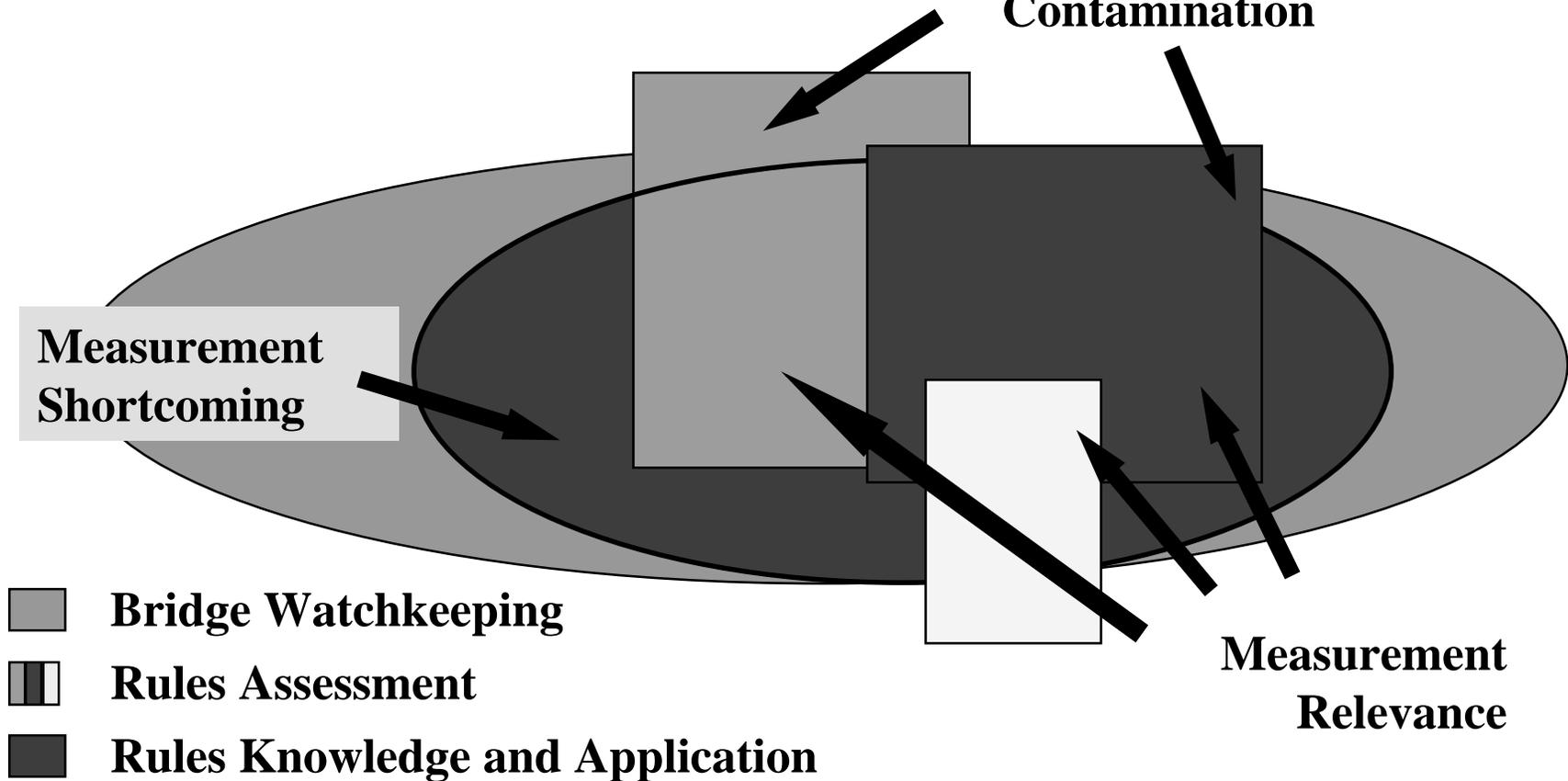
Measuring What You Want to Measure

What Gets Measured

Measurement Contamination

Measurement Shortcoming

Measurement Relevance



Example of Checklist Measure

Lookout Assessment Objective 4: Demonstrate lookout techniques and make lookout reports in clear visibility during daylight

- 4.1 List the sightings that should be reported when detected
- 4.2 Report sighted objects using ship's bell
- 4.3 Report sighted objects verbally using degrees
- 4.4 Report sighted objects verbally using points
- 4.5 Report sky objects verbally using points
- 4.6 Report audible target verbally using points

Example of Rating Measure

USMMA Cadet Watch Team Measure Examples

Measure	Rating
Compliance with Master's/Standing Orders	0, 1, 2
Proper Preparation for Arrival	0, 1, 2
Proper Internal Communications	0, 1, 2
Proper vhf Procedures	0, 1, 2
Master/Engine Room Kept Informed	0, 1, 2

Example of Objective Measure

ARPA — Situation Assessment

Target Data	Measure
Bearing	Degrees from Actual
Range	Nm from Actual
Course	Degrees from Actual
Speed	Nm from Actual
CPA	Nm from Actual
TCPA	Seconds from Actual

Comparison of Simulator and Shipboard Assessment

- How would you need to develop performance measures differently if you were developing procedures for simulator and shipboard assessment?

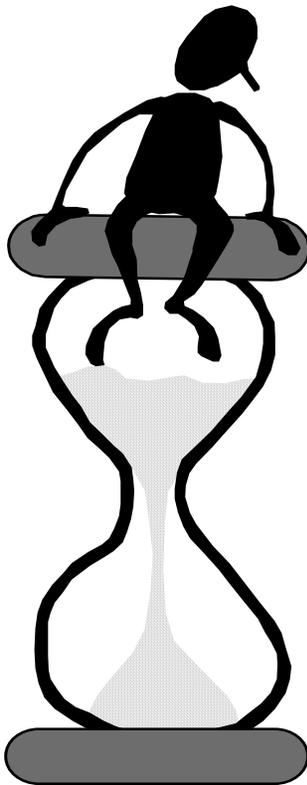
Exercise 5: Developing Performance Measures

- **Goal:** To develop performance measures for up to six lifeboat launching assessment objectives
- **Tools:**
 - Your group responses to Exercises 2-4
 - Rules of the Road example
 - Lookout duties example
 - Worksheet

Exercise 5, continued

- To get started:
 - Consider your lifeboat launching assessment objectives
 - Define specific performance measures for each objective
 - Remember that measures describe *observable actions* or *outcomes* and that they may be *objective* or *subjective*
 - Include both process and product measures
 - Please do not develop standards at this time

Exercise 5, continued



- See Attachments 1 & 2 for examples of performance measures for other types of assessments
- Record your group's answers on the overhead transparency
- Select a spokesperson
- You have 45 minutes

Exercise 5:

Example Performance Measures

- Following is based on task information given in “Launching Procedure for a Gravity Davit Lifeboat”
- Candidate:
 - Inspects releasing gear
 - Checks releasing gear lever
 - Inspects tricing pendant, sea painter
 - Checks drain plug
 - Inspects general conditions, arrangement of lifeboat equipment
 - Inspects man ropes, davit tracks, frapping lines
 - Locates hand crank
 - Communicates with other crew members clearly using proper terminology
- After each task, candidate reports to assessor on each measure

Step 4: Develop Proficiency Criteria, continued

Part 2: Develop Performance Standards

Measures and Standards

Measure	Standard
Correct charging	99%
Correct order filled	90%
CPA	More than 0.25 nm
ARPA set-up time	Less than 5 minutes

Performance Standards

- Performance standards are the criteria established as acceptable or target levels
 - Individual measure
 - Set of measures used to assess proficiency
- Performance standards incorporate:
 - Measure type
 - Specific performance measure
 - Specific assessment conditions

Performance Standards Example

- Specifications for equipment purchase
 - Determine requirements and objectives
 - Establish specifications (standards)
 - Purchase equipment
 - Check out equipment

Developing Performance Standards

- Identify candidate action or outcome
- Select/define measure
- Define general standard strategy
- Get input & reach consensus on standard for each measure
- Set acceptable range/develop precise definition for standards

Pass/Fail vs. Graded Standards

- Pass/Fail standards establish a minimum level of required ability
- Graded standards establish levels of performance

Graded vs. Pass/Fail Standards

Measure Used in Standard

Standard	Objective	Rating	Checklist
Graded	●	●	●
Pass/Fail			●

Developing Standards for a **Single** Performance Measure

- Basis (graded vs. pass/fail)?
- Who establishes scoring procedures?
- What is the process for gaining agreement on the standard?

Example of **Single Pass/Fail** Standard

Lookout Assessment Objective 4

PASS FAIL

- 4.1 **Measure:** Answers “Identify 6 of the sightings that should be reported when detected by the lookout.”
Standard: Correct response includes 6 from a list of appropriate responses
- 4.2 **Measure:** Reports sighted objects using ship’s bell
Standard: Reports at least 3 surface objects using ship’s bell. Improper reporting constitutes failure. Failure to detect visible objects within a specified sector of view constitutes failure.
- 4.3 **Measure:** Reports sighted objects verbally using degrees
Standard: Verbally reports at least 3 surface objects. Reports must be within 22-1/2° of actual bearing.

(Continued)

Example of **Single Graded Standard**

Rules CPA Measures and Standards for Selected Scenario

Minimum CPA

Rating

Greater than 0.5 nm

Expert

Between 0.25 and 0.5 nm

Qualified

Less than 0.25 nm

Unqualified

Scoring Procedures

- Combine multiple measures and standards
- Define proficiency in a selected area of assessment

Types of Scoring Procedures

IF the knowledge, skill, or ability being measured is...	THEN, scoring procedures should be developed that apply...
essential to safe and/or effective job performance	a pass/fail approach
useful in safe and/or effective job performance, but other mariner capabilities could readily compensate	a graded approach

Developing Standards for **Combined Performance Measures**

- Identify measures & standards of *critical* and *non-critical* job requirements
- Determine if measures should be combined
 - NO:** Multiple criteria for separate measures
 - YES:** Single criteria for combined measures
- Develop pass/fail & graded scoring procedures
- Develop comprehensive proficiency criterion across all measures

Developing **Combined** Standards

Example: **Hamburger Heaven**

- Multiple criteria for separate measures
 - If candidate fails any standard, **DO NOT HIRE**

Developing Performance Standards

Example: *Lookout Assessment Objective 4*

Measure	Standard	Score
1. Identifies six reportable sightings	Correctly reports six of appropriate sightings (from list)	Pass/ Fail
2. Reports sighted objects using ship's bell	Correctly reports at least 3 surface objects using ship's bell	Pass/ Fail
3. Reports sighted objects verbally using degrees	Correctly reports at least 3 surface objects, within $22\text{-}1/2^\circ$ of actual bearing	Pass/ Fail
4. Reports sighted objects visually using points	Correctly reports at least 3 surface objects within ± 2 points of actual bearing	Pass/ Fail
5. Reports sky objects verbally using points	Correctly reports at least 3 sky objects within ± 2 pts. of actual	Pass/ Fail
6. Reports audible targets verbally using points	Correctly reports at least 3 audible targets within ± 2 pts. of actual	Pass/ Fail

Combined Standard: Candidate must pass each measure to pass objective.

Combined Standards for Lookout

- Candidate must successfully perform each action identified under an assessment objective to pass that objective
- Candidate must pass each of the nine lookout assessment objectives in order to pass the assessment and demonstrate proficiency in lookout duties

Rules of the Road Example (Review)

**Rules
Knowledge**



**Prepared Written
Questions**

**Situation
Assessment**



**Mock Equipment -- Highly
Controlled View of
Simulated Traffic**

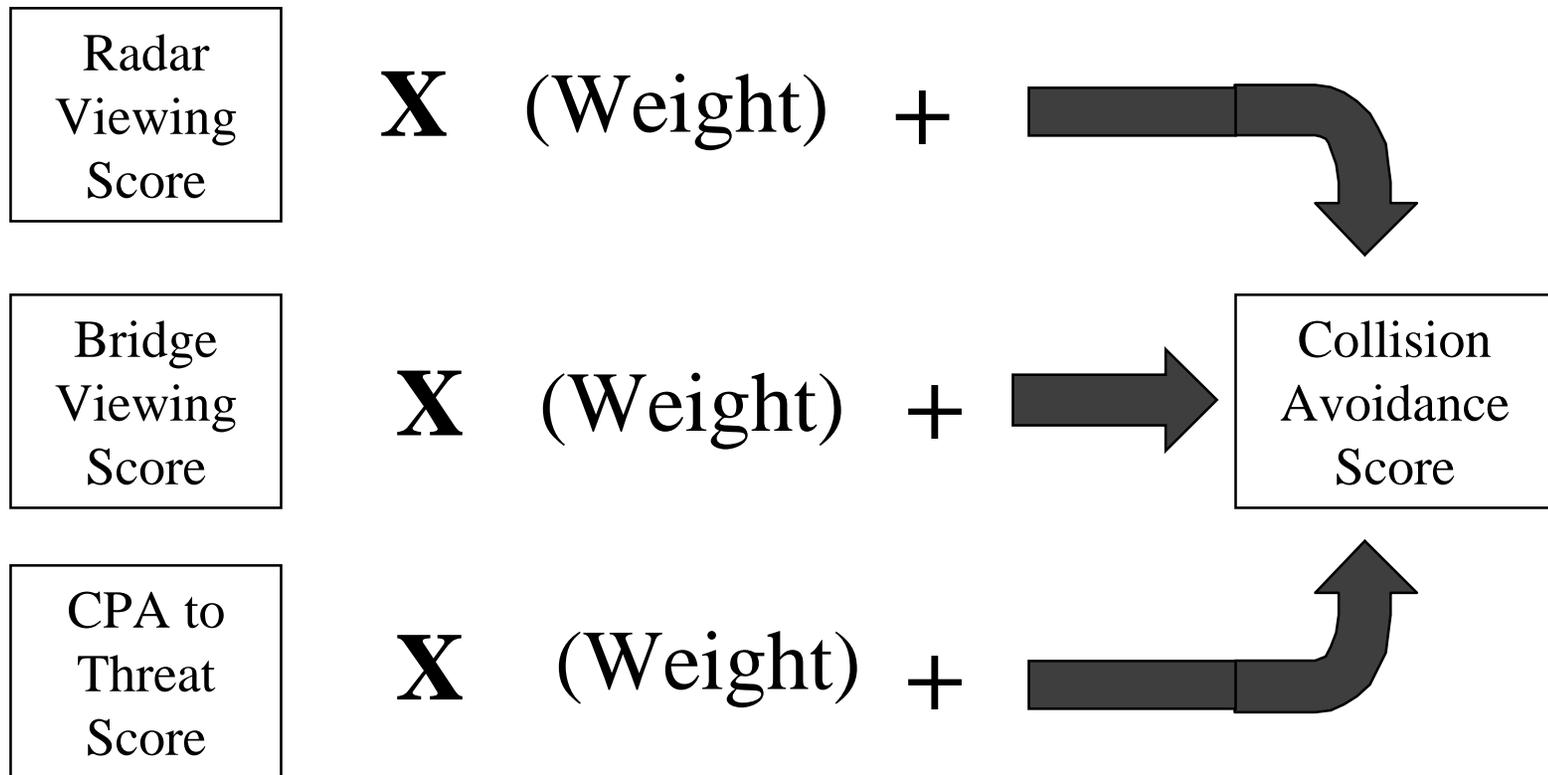
**Collision
Avoidance**



**Mock Equipment -- Control of
Vessel in Moderately
Controlled Simulated Traffic**

Developing Standards Example: Rules of the Road-1

- Collision Avoidance Score (simplified)

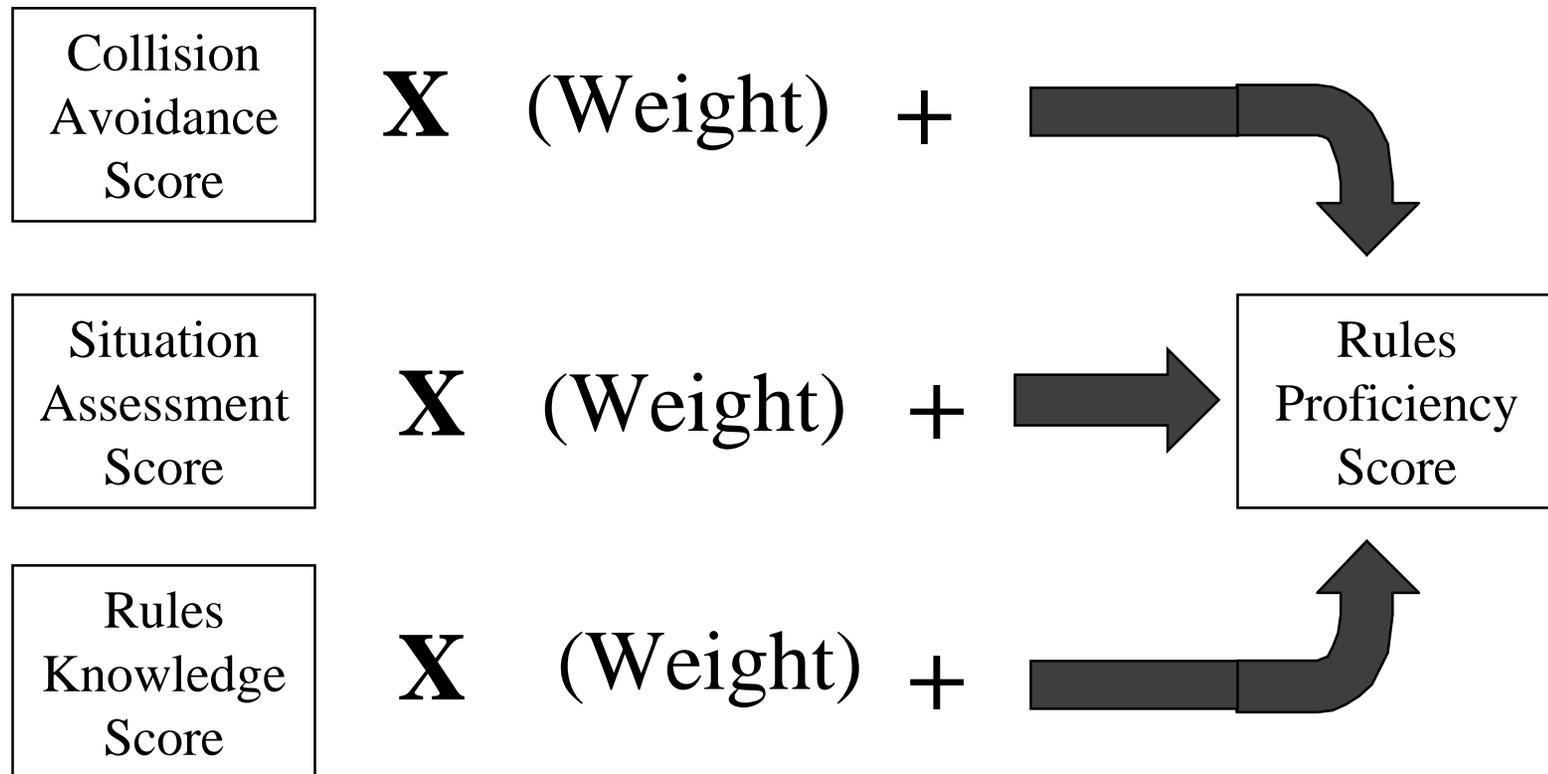


Collision Avoidance Proficiency Standard

- Maximum Score = 20
- Standard for Proficiency = 10

Developing Standards Example: Rules of the Road-2

- Collision Avoidance + Situation Assessment + Knowledge



Rules of the Road Proficiency Standard

- Maximum Score = 60
- Standard for Proficiency = 35

Comparing Simulator and Shipboard Assessment

- How would you need to develop performance standards differently if you were assessing via simulator or shipboard assessment?



Exercise 6: Developing Performance Standards

- **Goal:** To develop performance standards for up to three lifeboat launching assessment objectives
- **Tools:**
 - Performance measures developed in Ex. 5
 - Examples
 - Rules of the Road
 - Lookout

Exercise 6, continued

- To get started:
 - Consider performance measures you developed
 - Specify a scoring strategy for each measure
 - Pass / fail
 - Graded (e.g., *expert, qualified, not qualified*)
 - Determine who should be included in consensus-gathering meeting

Exercise 6, continued

- Determine standard(s) for each measure
- Specify your rationale
- Note how you would combine measures for a single objective
- Discuss development of measures/objectives into a combined proficiency criterion
- Record solution on your transparency
- Select a spokesperson
- You have 45 minutes

Exercise 6: Example Solution

- Assume shipboard inspection of Objective #1 - “person in charge carries out proper inspections”
- Use graded level scoring & define levels
 - **Expert:** Measure accomplished correctly, efficiently, without hesitation, using proper terminology
 - **Qualified:** Measure accomplished correctly with some thought and hesitation. Minor mistakes in terminology may be made.
 - **Not qualified:** Measure not accomplished, or accomplished incorrectly. Incorrect terminology used, which may result in misunderstandings.

Exercise 6: Example Solution, continued

- Example performance measures & standards
 - **Measure:** Candidate properly inspects, or supervises the inspection of, releasing gear.
 - **Standard:** Candidate correctly reports the condition of the releasing gear.

 - **Measure:** Candidate locates hand crank.
 - **Standard:** Candidate correctly reports proper location of hand crank.

Step 5: Prepare Assessment Materials

Steps in Preparing Assessment Materials

1. Prepare detailed assessment worksheets
2. Prepare assessor instructions
3. Prepare candidate instructions
4. Finalize written and oral test questions
5. Finalize simulator and/or shipboard procedures
6. Document references, source materials, and validation process

Template for Assessment Form

Section 1. Assessment Parameters

Assessment Objectives	<ul style="list-style-type: none"> ▪ <i>Describe lookout duties and responsibilities</i> ▪ <i>Identify lookout stations and safe routes onboard</i> ▪ <i>Describe and identify the international distress signals</i>
Assessment Method	Oral or written examination
Candidate Orientation	Examiner briefs the candidate on assessment methods, conditions, and standards
Required Equipment, Apparatus, and/or Tools	Examination proctor, test instrument, answers, and associated references
Initial Conditions	This assessment may be conducted either before or after the practical demonstration of lookout skills

Section 2. Performance Measures, Standards, and Scores

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>	Specifies that a lookout's duties are: sighting, identifying, and accurately reporting to the responsible authority all objects or sounds detected.	<ul style="list-style-type: none"> ▪ Pass ▪ Fail
Comments:			

Prepare Documentation

- Documentation provides a basis for external review & simplifies updating in the future
- Documentation should include:
 - Source of assessment objectives plus mapping between objectives, conditions, and measures
 - Standards and source of standards
 - Detailed procedures for conducting assessment
 - Assessment items, assessor materials, candidate materials, and performance measurement procedures

ARPA Assessment Example: Assessment Objectives

ARPA Assessment: Situation Assessment

1. Understanding the criteria for the selection of targets by automatic acquisition
 2. Appreciation of the uses, benefits and limitations of ARPA operational warnings
 3. Detection and identification of false echoes, sea return, racons, and SARTs
 4. The use of graphic representation of danger areas
 5. Knowledge and recognition of historic data as a means of indicating recent maneuvering of targets
-

ARPA Assessment Example:

Assessment Conditions

General Description: Fully functional ARPA in laboratory setting using several pre-designed operational exercises

Description of Exercise A

- Open waters scenario with mix of other vessels
- Own ship and Target *E* maneuver
- Target *D* reduces speed
- Target *C* is lost, resulting in lost target alarm actuation

ARPA Assessment Example: Assessor Instructions

Detailed Assessor Instructions for Exercise A

1. Before candidates arrive, de-initialize ARPA units so speed and compass settings are incorrect.
2. Before getting underway, verify that each candidate has correctly initialized the ARPA unit.
(more detail provided)
3. Ask each student to demonstrate the available display presentations and display modes.
(more detail provided)

Continues for 11 specific assessor steps

ARPA Assessment Example: Candidate Materials

Description of Exercise A Candidate Materials

- Vessel data card
- Set-up instructions
- Target data forms
- ARPA facsimile showing vessel history trails
- Several questions addressing interpretation of vessel history trails

ARPA Assessment Example: Measures and Standards

- Performance Scoring
 - Standards for individual measures provided
- Score Weighting
 - Means of summing/combining scores (TBD)
- Proficiency Standard
 - Overall standard for ARPA proficiency (TBD)

Lookout Assessment Example: Assessment Objectives

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

Lookout Assessment Example: Assessment Conditions

Lookout Assessment Objective 4:

- Lookout station equipped with internal communications system, ship's bell, 7x50 binoculars, and bearing repeater. Lookout station should be clear and Assessor must be able to observe activities.
- Conduct in clear visibility during daylight.
- Assessor should ensure that reportable objects are in sight.

Lookout Assessment Example: Candidate & Assessor Materials

Candidate Materials:

- *Candidate Instructions*
- *Assessment Control Sheet*

Assessor Materials:

- *Assessor Instructions*
- *Assessment Worksheets*
- *Assessment Control Sheet*

Lookout Assessment Example: Measures and Standards

Lookout Assessment Objective 4

Measure	Standard	Score
1. Identifies six reportable sightings	Correctly reports six of appropriate sightings (from list)	Pass/ Fail
2. Reports sighted objects using ship's bell	Correctly reports at least 3 surface objects using ship's bell	Pass/ Fail
3. Reports sighted objects verbally using degrees	Correctly reports at least 3 surface objects, within 22-1/2° of actual bearing	Pass/ Fail
4. Reports sighted objects visually using points	Correctly reports at least 3 surface objects within ± 2 points of actual bearing	Pass/ Fail
5. Reports sky objects verbally using points	Correctly reports at least 3 sky objects within ± 2 pts. of actual	Pass/ Fail
6. Reports audible targets verbally using points	Correctly reports at least 3 audible targets within ± 2 pts. of actual	Pass/ Fail

Comparison of Simulator and Shipboard Assessment

- How would you need to prepare the assessment materials differently if you were using simulation or shipboard assessment?

Summary

Steps in Developing Mariner Assessments

1. Specify Assessment Objectives
 - Identify regulatory requirements
 - Analyze job requirements
 - Describe individual assessment objectives
2. Determine Assessment Methods
 - Identify alternative assessment methods
 - Review advantages & disadvantages
 - Define assessment methods
3. Specify Assessment Conditions
 - Describe operational settings & scenarios
 - Specify written & oral questions

Steps in Developing Mariner Assessments (continued)

4. Develop Proficiency Criteria

- Identify components of assessment objectives
- Develop measures & standards
- Develop scoring procedures & proficiency criteria
- Validate measures, standards, procedures & criteria

5. Prepare the Assessment Materials

- Prepare detailed assessment worksheets
- Prepare assessor & candidate instructions
- Finalize written & oral questions
- Finalize simulator &/or shipboard procedures
- Document references, source materials, & validation

Concluding Remarks

- This workshop presents a thorough overview of the assessment development process.
- Accompanying materials provide greater detail and should be referred to as needed.