ETM TRAINING FOR CRISIS RESPONSE
SOME EXAMPLES OF THE CRISIS RESPONSE TRAINING FOR THE MARINE ENGINE SYSTEM USING A FULL MISSION SIMULATOR

Hachiro KIDO 1, Takashi KUWASHIMA 2

1 Professor of Marine Technical College JAPAN,
Nishikuracho 12-24 Ashiya City JAPAN,
81-797-38-6285, 81-0797-32-7904
kido@mail.mtc.ac.jp

2 Asso. Professor of Marine Technical College JAPAN,
Nishikuracho 12-24 Ashiya City JAPAN, 81-797-38-6270, 81-0797-32-7904
kuwashima@mail.mtc.ac.jp

ABSTRACT
On the MET that is adopted a simulator ETM (Engine Room Team Management) or ERM (Engine Room Resource Management) technique to be called is used. This method are established quickly and training let a ship return to a normal state effectively safely, and navigate is performed by appropriate, precise information exchange by using these techniques. On the other hands, crew manning system of many ocean shipping companies shift to multi nationalization crew system then decrease the member of ocean liner with this and the role of the seafarer's according to change these system. Furthermore, it tend to anxious about the difficulty tradition of the seamanship, a fall of basics seamanship because the experienced seafarer who does education training and the post-baby boom generation who possessed it in difficulty in near future and declining birthrate and reaching big mass of the retirement age in the coastal vessel. In such situations applied on ETM technique which are some crisis correspondence type ETM training given as training to contribute to safely of the engine plant in the education training that is used an engine room full mission type simulator. In addition, MET is requested ability evaluation that is demanded by a treaty or the simulator used for guarantee of the engineering ability to keeping satisfies. When a simulator is used for evaluation of the ability of the person who is going to get qualification, performance standard is going to get qualification definitely and explicitly and the score charge account for action evaluation or the rank charge account being careful significance. Also, for evaluate a trainee's ability, it need examination of reliability / the validity of the teamwork evaluation technique of the training team by the action observation. According to above mentions, we studied the following crises training tasks.

1. ETM training scenario for 20 kinds of typically crises here.
2. We makes three score tables that is consisted by numerical evaluation level regarding with Approaching ability, Trainee's Personnel ability, and Trainee's Team work ability.
3. We investigate about the team work ability that is ability trust; ability tradition and the harmony act by technique to evaluate teamwork for examine the reliability / validity.

Keywords: ETM Training, Crisis Response Training, Engine Simulator
1. INTRODUCTION
A mega-tanker, a coast service cargo boat, a ferry boat, high-speed container ships which is driven by a diesel engine, various shape ship and a ship of the size appeared in the world so far.

Furthermore, the crew system for an ocean going ship mostly change to multi-nationalization crew. According to these situations increasing danger operation can be founds such as an engine accident and a collision in small straits particularly. And the recent building ship is more professional and load a high quality engine plant, and it is designed them by limitation crew to be able to control it by minimum operation. Therefore it is the present conditions that the engineer whom it is good, and was trained to be able to perform effective operation in every situation is demanded.

As for the modern ship, ship technology such as total-distributed data monitoring system, engine remote control system and some preventive & planned maintenance system are progressing rapidly.

These technology requests more economic and more significant at the same time to let realize the latest unified ship management system by enormous electronic technique.

A ship cannot get the synergy effect when some factor are not cooperated on system mutually such as the inspection system, recovery technology, information and communications technology, maintenance works technique and factor of training education system. It seems that ship is not only old as for the main factor of the serious sea disaster, but also not to be keeping these function effected enough. Some ocean going shipping companies are strong request adaptable fighting potential to their new comers, but it is caused a delay in operation by many ships are expected easily if it make full use of the latest integrated ship management system by the above-mentioned electronic technique and it is early and devises a diagnosis and extend the plant life plan of the existing ship and does not carry it out at the same time.

Therefore, the introduction of the education training simulator is indispensable and, as means to supplement tradition of the seamanship, shortens training time, and an engine room full mission type simulator is introduced because it can master about the contents which cannot train to cause a delay in navigation with the actual plant. By the training that used a simulator ETM (Engine Room Team Management) or ERM (Engine Room Resource Management) technique to be called is used. This method are established quickly and training let a ship return to a normal state effectively safely, and navigate is performed by appropriate, precise information exchange by using these techniques.

On the other hands, crew manning system of many ocean going shipping companies are shifting to multi-nationalization crew system, then decrease the member of ocean liner with this and the role of the seafarer's according to change these system. Furthermore, it tend to anxious about the difficulty tradition of the seamanship, a fall of basics seamanship because the experienced seafarer who does education training and the post-baby boom generation who possessed it in difficulty in near future and
declining birthrate and reaching big mass of the retirement age in the coastal vessel. In such situations applied on ETM technique which are some crisis correspondence type ETM training given as training to contribute to safely of the engine plant in the education training that is used an engine room full mission type simulator. We examined the following ETM training scenario for 20 kinds of typically crises here.

1. SOME CONCRETE REQUIREMENTS AS A SIMULATOR FOR ENGINEER TRAINING

Following requirements are given as a simulator for the training.

a. Improvement of the crewman's technology --- to be skill up

b. Training of the tradition of sea skill and the initial adaptation ability --- to be train adaptable fighting potential

c. Seafarer's education : increase training in efficiency --- to be shortening of the education training time of seafarer

d. Exclusion of the danger in the actual maintenance training. ---to be imaginative actualization

e. Exclusion of the danger in the unusual crisis response training. --- to be use the mimic audio visualization imagination training

2. SPECIFICATION OF THE ENGINEER TRAINING SIMULATOR

It is added to the above general idea as concrete requirements as simulator for the engineer training with satisfying an index about the use of engine simulator in STCW95, and some functions of engine room simulator for crisis response training are considered as follows.

1) The machine parts which fitted a new technology being used

2) What can supply with the number of years when used machine parts.

3) To be keeping the function for the number of years when used technology is suitable and constant.

4) Do not fit only an individual maker and product, and keep versatility.

5) How to get in simulation time is arbitrary, and time setting to be free.

6) To keep the plasticity by the elapsed time when the plasticity of the trial is highly appointed.

7) Being easy to get a training record, evaluation information

8) When training contents and a system is change, it is possible by software under cheap cost.

9) To be prepared an illustration of engine room arrangement of the model ship that is incorporated in simulators.

10) Model ship and heat balance diagram of the simulator and essential points list being prepared.

11) The results such as many data displayed by simulation being a value by model ship and approximations

12) Between the performance of the simulator of the model ship and engine plant shop trial results and the sea trial results to be inspected.

13) Model ship and automation specifications of the simulator and setting point list to be prepared and the performance of the simulator being inspected.

14) A main engine and related engine plant performance to be simulate closely and can confirm the breaking point.

15) The supercharger with the main diesel engine can do one cut driving.

16) State setting of the damage (ex. cylinder liner crack trouble) of main engine structure required
being possible.

17) The simulator can do state simulation after the damage
18) Some damages of a remote control system and each component of the electronic governor can be simulated and correspondence actions can be established.

19) The damage of the shaft seal device, trouble and correspondence actions for it being true ship like possibility.

20) An essential points list and drawing of the auxiliary machine of model ship to be prepared. A local operation panel of simulator is satisfying the function of model ship.

21) The simulator does not depend on scenario setting, and simulating plant performance for any kind of operation. Fig.1 simulator is full filled condition as things mentioned above.

Figure 1: Photos are MHI (NYK Fil in Manila) diesel simulator

3. TRAINING CONCEPTS AND TASKS FOR ETM CRISIS RESPONSE TRAINING

As a crisis response training in engine room, main concepts are considered as following functions.

1) General evaluation about the human factor at the time of the engine plant operation and training of the recognition about the human being reliability
2) The reproduction of the engine accident scenario which can really happen by ship
3) It performs the action of the case, observation / the analysis of physiologic data.

And as a task for ETM crisis response training are the next.

1) Making of the engine accident scenario
2) Making of the recognition questionnaire about the human being reliability
3) Making of an action questionnaire by a thing of generate every accident example and the observation questionnaire of physiologic data
4) Making of the examination trial manufacture of the analysis technique to evaluate of the questionnaire

4. NECESSARY TRAINING CASES FOR ETM CRISIS RESPONSE

Such as above mentions, actual ocean going shipping company in Japan have not a many skillful ship engineers and tend to reducing these number of crews caused by declining birthrate, reaching big mass of the retirement age seafarers and some economical background. This meaning, actual young engineer tend to have not a chance to get critical accident experiences and small chance learning from skillful old engineers. When some critical situations happened in engine plant and if young engineer duty in watch then he is going to recover to normal conditions, he will be able to good work if he had some
experience about treatment for the critical situations. But if he had not any experience....?

As a results of these back ground, we make plant to train for crisis condition to train quickly, correctly, appropriately and safety as indicate following items,

<table>
<thead>
<tr>
<th>Item of Crisis Training</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Engine Room Fire Fighting on M/E, D/G or Aux.Boiler</td>
<td>Port rest S/B Navigation</td>
</tr>
<tr>
<td>caused by FO high pressure pipe leak or FO scattering</td>
<td></td>
</tr>
<tr>
<td>3. E/R Central CSW Cooler Cover Broken</td>
<td>Port rest Navigation</td>
</tr>
<tr>
<td>caused by Sea water flooding in engine room</td>
<td></td>
</tr>
<tr>
<td>4. E/R Countermeasure Procedure against Terrorist strike</td>
<td>Port rest S/B Navigation</td>
</tr>
<tr>
<td>Sea water flooding + FO leak + Black-out Evacuate E/R</td>
<td></td>
</tr>
<tr>
<td>7. M/E Trip by Governor fail, Pneumatic Line fail on ERS</td>
<td>S/B Navigation</td>
</tr>
<tr>
<td>8. M/E Trip by Governor fail, Pneumatic Line fail on RCS</td>
<td>S/B Navigation</td>
</tr>
<tr>
<td>10. M/E Abnormal Trip by LO Low Pressure</td>
<td>S/B Navigation</td>
</tr>
<tr>
<td>caused by M/E LO Strainer, LO Pump or Crosshead PP</td>
<td></td>
</tr>
<tr>
<td>11. M/E Slow Down by Cylinder Fire</td>
<td>Navigation</td>
</tr>
<tr>
<td>12. M/E Slow Down by LO Pump Abnormal</td>
<td>Navigation</td>
</tr>
<tr>
<td>by Jacket CFW Pump Abnormal</td>
<td></td>
</tr>
<tr>
<td>by Piston CFW High Temperature</td>
<td></td>
</tr>
<tr>
<td>caused by Piston Cooler Fouling Air Cooler Fouling</td>
<td></td>
</tr>
<tr>
<td>or by Jacket CFW out Trouble</td>
<td></td>
</tr>
<tr>
<td>15. M/E Slow Down by Piston Under Space High Temperature</td>
<td>Navigation</td>
</tr>
<tr>
<td>caused by Piston Under Space Fire, by Blow-off by gas</td>
<td></td>
</tr>
<tr>
<td>detecting or by Scavenging Air abnormal</td>
<td></td>
</tr>
<tr>
<td>17. 440V high pressure Electric system short circuit</td>
<td>Port rest S/B Navigation</td>
</tr>
<tr>
<td>18. Propeller falling off</td>
<td>Navigation</td>
</tr>
<tr>
<td>19. Aux. boiler tube leak by accidental fire side</td>
<td>Port rest S/B Navigation</td>
</tr>
<tr>
<td>20. Exhaust Gas Economizer fire</td>
<td>Port rest S/B Navigation</td>
</tr>
</tbody>
</table>

5. GENERAL PERFORMANCE STANDARD FOR A SIMULATOR USED FOR ABILITY EVALUATION

Education and training facility is requested ability evaluation that is demanded by a treaty or the simulator used for guarantee of the engineering ability to keeping satisfies.
When a simulator is used for evaluation of the ability of the person who is going to get qualification to prove an ability level, the trainer (or evaluator) must pay attention to the next matter.

1) Performance standard is defined definitely and explicitly, and they are availability and available for the trainee.

2) Trainer uses techniques to establish an evaluation standard definitely and do reliability of the evaluation and unity explicitly, and do the objective evaluation to the maximum, and minimize subjective judgment.

3) The duties that the person who is going to get qualification should be estimated and / or a skill and their ability receive explanation about decided duties and an action standard definitely.

4) To be considered a normal operative procedure in the evaluation of the action and interplay with a simulator manager or the person.

5) Score charge account or the rank charge account for performance evaluation should be careful when till significance is confirmed.

6) Being the first standard to prove security and ability to accomplish a problem effectively so that the person who is going to get qualification as satisfies.

According to these objects, we make following three score tables that is consisted by numerical evaluation level regarding with Approaching ability, Trainee's Personal ability, and Trainee's Team work ability.

5.1. Numerical Evaluation Level by Approaching Observations
This ability is evaluated using numerical scores to the 20 kinds of crisis troubles as shown in Table-1.

5.2. Numerical Evaluation Level by Requirement of Trainee's Personnel Ability
This ability is evaluated using numerical scores to the trainee's personnel abilities in Table-2.

5.3. Numerical Evaluation Level by Requirement of Trainee's Team work Ability
For evaluate a trainee's ability, it need examination of reliability / the validity of the teamwork evaluation technique of the training team by the action observation.

As well as expertise / knowledge to solve a problem / a problem, a member makes use of each other's good points to show a superior team performance, and teamwork to raise a performance of the whole team while. In addition, supplementing a bad point is indispensable. Although it is recognized for a long time, as for the importance of this teamwork, the evaluation is entrusted to the subjectivity of the evaluator, and there is the case that guidance for evaluation and teamwork improvement is different by an evaluator.

Therefore we study an action and the necessity of evaluating teamwork from the consciousness. About the former, we made teamwork evaluation sheet by the action observation. By all 10 elements, we are done action investigation for the team, ability trust, ability tradition and the harmony act by technique to evaluate teamwork for examine the reliability / validity as shown next.
Table 1: Evaluation level by Approaching Observations

<table>
<thead>
<tr>
<th>Evaluation Items</th>
<th>Point</th>
<th>5 ~ 4</th>
<th>3 ~ 2</th>
<th>1 ~ 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Engine Room T/G, D/G Black-Out</td>
<td>5</td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Engine Room Fire Fighting on M/E, D/G or Aux.Boiler</td>
<td>3</td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>3. E/R Central CSW Cooler Cover Broken</td>
<td>3</td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>4. E/R Countermeasure Procedure against Terrorist strike</td>
<td>2</td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>5. M/E Remote Control System Abnormal on the ERS</td>
<td>4</td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>6. M/E Remote Control System Abnormal on the RCS</td>
<td>3</td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>7. M/E Trip by Governor trouble, Pneumatic Line fail on the ERS</td>
<td>4</td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>8. M/E Trip by Governor trouble, Pneumatic Line fail on the RCS</td>
<td>2</td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>9. M/E Uncontrollable Automatic Control Source fail</td>
<td>1</td>
<td></td>
<td></td>
<td>★</td>
</tr>
<tr>
<td>10. M/E Abnormal Trip by LO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- They can recognize trouble situations easy and adequate recovery works done within 5 minutes.
- They need adequate recovery actions for a while (more than 5 minutes) and be observed some wrong treatments or ordering.
- They cannot recognize trouble situations and took wrong recovery actions.
<table>
<thead>
<tr>
<th>Event Description</th>
<th>Rating</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Pressure</td>
<td>3</td>
<td>⭐</td>
</tr>
<tr>
<td>11. M/E Slow Down by Cylinder Fire</td>
<td>3</td>
<td>⭐</td>
</tr>
<tr>
<td>12. M/E Slow Down by LO Pump Abnormal</td>
<td>5</td>
<td>⭐</td>
</tr>
<tr>
<td>13a. M/E Slow Down by Piston CFW Pump Abnormal</td>
<td>5</td>
<td>⭐</td>
</tr>
<tr>
<td>13b. M/E Slow Down by Jacket CFW Pump Abnormal</td>
<td>5</td>
<td>⭐</td>
</tr>
<tr>
<td>14a. M/E Slow Down by Jacket CFW High Temperature</td>
<td>5</td>
<td>⭐</td>
</tr>
<tr>
<td>14b. M/E Slow Down by Piston CFW High Temperature</td>
<td>5</td>
<td>⭐</td>
</tr>
<tr>
<td>15. M/E Slow Down by Piston Under Space High Temperature</td>
<td>3</td>
<td>⭐</td>
</tr>
<tr>
<td>16. M/E Slow Down by Turbo Charger Surging</td>
<td>3</td>
<td>⭐</td>
</tr>
<tr>
<td>17. 440V high pressure Electric system short circuit</td>
<td>3</td>
<td>⭐</td>
</tr>
<tr>
<td>18. Propeller falling off</td>
<td>3</td>
<td>⭐</td>
</tr>
<tr>
<td>19. Aux. boiler tube leak by accidental fire side</td>
<td>3</td>
<td>⭐</td>
</tr>
<tr>
<td>20. Exhaust Gas Economizer fire</td>
<td>3</td>
<td>⭐</td>
</tr>
<tr>
<td><strong>Total Safety Level</strong></td>
<td></td>
<td>76</td>
</tr>
<tr>
<td><strong>Max.mark</strong></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>
Table 2: Requirement of Trainee's Personnel Ability

<table>
<thead>
<tr>
<th>Point</th>
<th>Requirement of Trainee's Personnel Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Logical Ability</td>
<td>He can think the situation by logically. When trouble happened.</td>
</tr>
<tr>
<td>2. Reporting Ability</td>
<td>He can understand and talk simply to the C/E about the trouble situations clearly.</td>
</tr>
<tr>
<td>3. Planning Ability</td>
<td>He can make a plan to recovering or he has some idea to resolve method when trouble condition is generated and explain to the team member.</td>
</tr>
<tr>
<td>4. Memorize Ability</td>
<td>He can write the situation on a paper as time depending. within 200 words.</td>
</tr>
<tr>
<td>5. Patience, Activity</td>
<td>Patience is; capable stay in hazard situation more than 10 minutes, or not give up recovery operation</td>
</tr>
<tr>
<td>6. Positive approach</td>
<td>He take a cautious but positive approach</td>
</tr>
<tr>
<td>7. Carefulness / Attentive Ability</td>
<td>He has an ability which is done the recovering work carefully and prepared the tools, make plans and manage before work.</td>
</tr>
<tr>
<td>Concentration Ability</td>
<td>He can break through the work with concentration.</td>
</tr>
<tr>
<td>8. Quick Action Ability</td>
<td>When trouble happened, he responses as adequate action. Or he looks like scatterbrained person.</td>
</tr>
<tr>
<td>9. Exercise and /or experience Ability</td>
<td>He has some experience and knowledge about this work.</td>
</tr>
<tr>
<td>10. Overcome as safety and effectively Ability</td>
<td>He overcame as safety and effectively about this work.</td>
</tr>
</tbody>
</table>

Point

Max. mark 50

Min.: 1 Lower than Ave.: 2 Average: 3 Higher than Ave.: 4 Max.: 5

Figure 2: Engine Room Full mission simulator in MTC
### Table 3: Requirement of Trainee's Team work Ability

<table>
<thead>
<tr>
<th>Point</th>
<th>Evaluate Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Orientation as a team</strong></td>
<td>Trainee pleased with the result of the team mate and, in acknowledgment of a good point / ability, work together in competition each other.</td>
</tr>
<tr>
<td><strong>1. Oriented in harmony with team members</strong></td>
<td>Observance of the procedure are positive for duties accomplishment that a skill in enthusiasm through OJT or the local meeting and tradition of the knowledge to team members.</td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>Trainee make responsibility and the role of the team mate clear and, in coordination with an opinion, send clear instructions and deal calmly even in emergency.</td>
</tr>
<tr>
<td><strong>3. Instructions in the duties accomplishment</strong></td>
<td>Trainees hear stories of the team mates well and enliven a motivation of the whole team. He leaves a way of the work to others.</td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>Through the training and a lecture, a trainee make a planning for adequate team work action using the effective information.</td>
</tr>
<tr>
<td><strong>4. Consideration in personal relationships</strong></td>
<td>The feedback of training results and not related work are reported to C/E, too. After the feedback actions, team work efficiency is change better progressing.</td>
</tr>
<tr>
<td><strong>Duties system</strong></td>
<td>Trainee talk about a whole plan with all the members and decide and accept the situation and revise an aim and he can put it together and adjust how to lead each other's work to progress.</td>
</tr>
<tr>
<td><strong>5. Duties accomplishment system</strong></td>
<td>Trainee talks as for the one except for the work as well. He talks about work without stingy with his knowledge and experience.</td>
</tr>
<tr>
<td><strong>Team process</strong></td>
<td>He has a proud that it is the member of the team and feels charm to team mates.</td>
</tr>
<tr>
<td><strong>8. Information sharing and mutual support</strong></td>
<td>It is going to solve a problem without being dressed in having nothing to do with when discord occurred by a disagreement and an emotional problem in a team.</td>
</tr>
<tr>
<td><strong>Team identities</strong></td>
<td>Max.mark 50</td>
</tr>
<tr>
<td><strong>Min.: 1</strong></td>
<td>Lower than Ave.: 2</td>
</tr>
<tr>
<td><strong>Average: 3</strong></td>
<td>Higher than Ave.: 4</td>
</tr>
<tr>
<td><strong>Max.: 5</strong></td>
<td>36.36</td>
</tr>
</tbody>
</table>

Totally Mark: 148 (74%)
6. AN EXAMPLE OF CRISIS TRAINING SCENARIO

6.1 Engine Room Turbo Generator Blackout Recovery Procedure on R/UP mode (Ocean-going)

This training is done for correspondence at the time of the blackout by the trip of the turbo generator. When a turbo generator becomes the over speed state by some causes the turbine is tripped. While reach to the trip state it can recognize a rise of the voltage and a rise of the frequency on the console. Either of stand-by D / G by the trip of the turbo generator starts for backup, but the power supply of the system is in a condition of the blackout in a second to take time for establishment of the voltage a little. After established the voltage on main switch board mainly electric drive machinery will be programmed start sequentially according with time schedule. This is an after blackout sequence. The auxiliary machinery started automatically are grouped according to the priority order beforehand, and it can give to the system the gap for several seconds every each group, and it is started. Protection of the whole engine plant system is accomplished in this way, but, depending on time to need it for voltage establishment, an emergency stop factor of the main diesel engine acts and needs attention because the main diesel engine can stop it. Because the blackout sequence is arranged to the last in after by a purpose of system protection, all auxiliary machinery do not recover in a normal voyage condition. Therefore, after restoration by the sequence, trainee enters work to restore by manual operation with necessary auxiliary machinery. After this training, the training of the manual operation after the blackout is possible, because the cancellation of the blackout sequence is possible by the change of the switch of the instructor desk.

6.2 Make a study items for T/G trip conditions and D/G back-up conditions

For the contents which trainer should make a study here, trainer side should touch it about a trip condition of T/G and a backup condition of D/G.

[T/G trip conditions]
The cause that T / G does a trip of during a voyage are shown as follows
(1) LO pressure fall  (2) over speed  (3) condenser vacuum fall  (4) abnormality vibration
(5) A drain trap closure

[D/G back-up conditions]

If D/G satisfies a start condition, and a Ready to Stan-by lamp on the console turns on, back it up in the next condition.

(1) A steam pressure fall of excessive  (2) T/G of the load of T/G  (3) An emergency trip of T/G

Procedure-1  At first, the start of the training, to be set a full mission engine room simulator (called the following simulators) in R/UP mode (Ocean-going).

Procedure-2  The second, following engine plant is set.
The main diesel engine : NCR mode,  Exhaust gas economizer: use,  Auxiliary boiler : S/B,
T/G ACB on, S/G : off,  D/G : S/B mode,  and the electricity assumes it T/G 80 % load.

Procedure-3  BLACK OUT.
TRIP of T/G has a mechanical factor and an electric factor, but let operate either and do TRIP of T/G and result in BLACK OUT.
[mechanical factor]  OVER SPEED, LO LOW PRESS, VACUUM LOW
[electric factor]  FREQUENCY ABNORMAL, VOLTAGE ABNORMAL, REVERSE CURRENT

Procedure-4  BLACK OUT.
As an other black out procedure, it can make a BLACK OUT with a T/G Over Load button or a T/G ACB interception button installed in the instructor console of the simulator.

Procedure-5  After black-out sequence.
After established the voltage on main switch board by BLACK OUT, mainly electric drive machinery will be programmed start sequentially according with time schedule. The next, auxiliary machinery started automatically are grouped according to the priority order beforehand, and start sequentially that is given to the system the gap for several seconds every each group.
Let trainee confirm that start D/G and start auxiliary machinery after voltage establishment automatically as shown as below.

**A second**

<table>
<thead>
<tr>
<th>Steering Gear</th>
<th>100V line</th>
<th>Stern Tube LO PP</th>
<th>FW PP</th>
<th>Drink Water PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-FO Trans PP</td>
<td>Elevator</td>
<td>D/G FO Feed PP</td>
<td>D/G FO Circ. PP</td>
<td></td>
</tr>
</tbody>
</table>

**Five seconds later**

<table>
<thead>
<tr>
<th>M/E LO PP</th>
<th>JCFW PP</th>
<th>M/E Aux Blower 2 Sets</th>
<th>M/E Aux Blower 2 Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/E Aux Blower 2 Sets</td>
<td>M/E Aux Blower 2 Sets</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**10 seconds later**

<table>
<thead>
<tr>
<th>Steering Gear the 2nd</th>
<th>Cam Shaft LO PP</th>
</tr>
</thead>
</table>

**15 seconds later**

<table>
<thead>
<tr>
<th>FO Supply PP</th>
<th>Engine Room Vent Fan 2 Sets</th>
<th>FO Circ. PP</th>
</tr>
</thead>
</table>

**25 seconds later**

<table>
<thead>
<tr>
<th>Air Compressor</th>
<th>Aux.Boiler Water Circ.PP</th>
<th>Feed Water PP</th>
</tr>
</thead>
</table>

**30 seconds later**

40 seconds later
M/E Aux Blower  2 Sets

**Procedure-6** Reporting & change systems

The first, trainee report the situations to Chief Engineer(C/E) and W/H, then change the main engine control position from the W/H to C/R and confirm the change of the fuel oil from C-oil to A-oil if it is necessary, the start of the auxiliary boiler, reset of the main diesel engine by means of C/R maneuvering handle set to STOP position and confirm the vital machinery.

**Procedure-7** Start manually starts machinery.

The second, trainee perform restart confirmation of the following manual operation start machinery.

- SW Service PP
- CSW PP
- GS/Ballast PP
- Fire/GS PP
- C-FO Purif
- Feed PP
- C-FO Purif
- A-FO Purif
- LO Purif
- LO Puri Trans PP
- D/G FO Circ PP
- Bilge PP
- CSW PP for Air Cond.
- Reefer Container CFW/CSW PP
- Air Conditioner Evaporator (Distiller) Purif.
- Room Vent Fan
- Shafting Room Vent Fan
- Aux Boiler Fitting Equipment

**Procedure-8a** Recovery

After main diesel engine restart, a main diesel engine load up and re-start T/G if trainee can confirm that all situation is good in order.

**Procedure-8b** Set overload on D/G running **Preference Trip mode**

Trainer set the overload on D/G running before T/G re-starting.

Trainer set load in a ship installed in the instructor console of the simulator than 90% of the D/G load and make an Over Load state. As results of this operation, it is generated preferential trip by select ACB interception(shut down).

Trainee let confirm that following auxiliary machinery does a pre-trip

1st Step Preference Trip

- Windlass
- Air Conditioning Ref.
- CSW PP for Air Conditioning Ref.

2nd Step Preference Trip

- Vent Fan for Cargo Hold
- Fresh Water PP for Reefer Container
- CSW PP for Reefer Container
- 50% of Reefer Container

3rd Step Preference Trip

- 50% of Reefer Container
- Bow Thruster

The trainee report the situations to Chief Engineer(C/E) and W/H, then change the main engine control position from the W/H to C/R and confirm the change of the fuel oil from C-oil to A-oil if it is necessary, the start of the auxiliary boiler, reset of the main diesel engine by means of C/R maneuvering handle set to STOP position and confirm the vital machinery.

**Procedure-9**

After confirmation of the preferential trip machinery, trainee let do TRIP of D/G running before T/G re-starting.

TRIP of D/G has a mechanical factor and an electric factor, but let operate either and do TRIP of D/G and result in BLACK OUT.

[mechanical factor]

- OVER SPEED, 
- LO LOW PRESS, 
- JCFW Outlet Temp. High
- JCFW Outlet Press Low 
- LO Outlet Temp High 
- Crank Case Oil Mist High

- 509 -
Procedure-10  BLACK OUT.

As another black out procedure, it can make a BLACK OUT with a D/G Over Load button or a D/G ACB interception button installed in the instructor console of the simulator.

Procedure-11

As a result of Black-out, stop the main diesel engine, start an Emerg/Gen and running only vital machinery. The trainee report the situations to Chief Engineer(C/E) and W/H, then change the main engine control position from the W/H to C/R and confirm the change of the fuel oil from C-oil to A-oil if it is necessary, the start of the auxiliary boiler, reset of the main diesel engine by means of C/R maneuvering handle set to STOP position and confirm the vital machinery.

Procedure-12

Let trainee check the causes on the D/G local side and use a simulator mimic board. Trainee report to C/E and C/R about a cause with a transceiver.

Trainees use an A-fuel oil for Emerg. Generator and recovered D/G after a report to C/E and start one D/G.

ACB interception of Emerg/Gen. and ACB on of D/G after BLACK OUT once.

Procedure-13

Trainee confirms that it is started auxiliary machinery as follows by manual operation.

It is confirm the running condition only if start D/G and established voltage then start auxiliary machinery automatically.

The first start

Steering Gear 100V line Stern Tube LO PP FW PP Drink Water PP
C-FO Trans PP Elevator D/G FO Feed PP D/G FO Circ.PP Aux. Boiler FO PP

The second start

M/E LO PP JCFW PP M/E Aux Blower 2 Sets M/E Aux Blower 2 Sets
Aux.Boiler FDF Feed Water PP
I make auxiliary boiler ignition mind steaming It is a D/G fuel oil C change afterwards

The third start

Steering Gear the 2nd Cam Shaft LO PP

The fourth start

FO Supply PP Engine Room Vent Fan 2 Sets FO Circ. PP

The fifth start

Air Compressor Aux.Boiler Water Circ.PP

The sixth start


The seventh start

M/E Aux Blower 2 Sets
To do a next main diesel engine start order increase speed

The eighth start

SW Service PP CSW PP GS/Ballast PP Fire/GS PP C-FO Purif Feed PP
7. ACKNOWLEDGEMENT
A person of the training facility where business evaluates the ability of the seafarers is requested as following items.

To be taken appropriate guidance about an evaluation method and the business. He satisfies an evaluator having the experience and get real evaluation experience under the supervision.

On the other hand, as for the person having the responsibility, it is necessary evaluation system, evaluation method and to completely understand a real way for a supervisor of the business evaluation of the ability of the seafarers. These demand items become the basic indicator continuously for a training institution and various seamanship educational institutions.

8. CONCLUSION
When a simulator is used for evaluation of the ability of the person, who is going to get qualification, we used the numerical evaluation methods that is consisted three score tables regarding with Approaching ability, Trainee's Personnel ability, and Trainee's Team work ability to evaluate the engineer officer on the crisis response training for the marine engine system using ETM training scenario for some typically crises.

As a results of investigate about the team work ability that is ability trust, ability tradition and the harmony act by technique to evaluate teamwork for examine the reliability / validity can see good effected and the crisis response training for the marine engine system are accepted by actual in-house training for shipping lines.

9. REFERENCES
IMO Training Record Book Model Course 7.04 STCW Reg Ill/4