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# Problem-Solving For Marine Crew Members

## Outline of Two-Day Program



### Introduction

Not every vessel that leaves the safety of the harbor is able to return home again.

In the interest of the personal safety of marine crew members and service personnel, we propose advanced training to help service people more effectively develop emergency equipment repair solutions to keep the boat going and bring everyone home safely.

In this two-day seminar, our presenters, all people from the marine industry, use storytelling and documentation that captures the essence of actual emergencies where resourcefulness made a difference and allowed people to remain safe. Through this training, service personnel will become highly qualified equipment problem solvers. Participants will increase their creative problem-solving ability within the constraints of their own skill levels. We will also suggest areas of ongoing study to increase their skill level while providing examples of successful solutions.

A good foundation in the equipment maker's documentation complements such training. However, it is difficult to switch one's mindset from strictly following factory documentation to considering sound creative solutions. There are two reasons for this: first, it clashes with our "value system" of doing things by the book. Secondly, the fear of failure can limit people from getting creative and coming up with their own solutions.

The marine crew member's job is to keep the boat's equipment going under conditions that the factory could not have anticipated. Such situations will arise during foul weather, hurricanes, tidal waves, boat sinkings, grounding, and onboard fires.

Let's begin now by looking at how to increase our problem-solving capabilities.

# Learning Creative Problem Solving

- 1 - Storytelling by the presenters fosters “possibility thinking” in participants.
- 2 - This helps participants reconcile their value system to include creative solutions during life-threatening situations.
- 3 - The fear of failure is also addressed as presenters tell of their own experiences in thinking through the options in distressing situations. Further, they discuss their reasoning and how they weighed the risks and benefits before proceeding in the lowest risk approach available at the time and place.
- 4 - Participants are guided to create a mental folder for resourcefulness and creativity as it applies to equipment.
- 5 - Hundreds of equipment workaround possibilities are presented in the form of the course text, *Get Home From Anywhere*.
- 6 - Participants learn to actively work to spot this creative ability in others.
- 7 - Participants will consider how problem-solving scales to fit the problem at hand. For example, the mindset that helps us open a can of beans without a can opener while camping will also help us solve much larger problems.
- 8 - Presenters will include gamification to address the fear of failure (more on this below).
- 9 - Participants will be encouraged to read books and/or watch videos that have an emphasis on the mechanics of survival. Following are publications to consider:

*Port of Refuge* - Dan Magone

*To Build a Fire* - Jack London

*Army Rigging Manual (FM 5-125 C1)*

*TM 9-243 Use and Care of Tools*

*FM 3-5 Electrical Power Generators, Field Operations*

*Get Home From Anywhere!* - B. Evridge

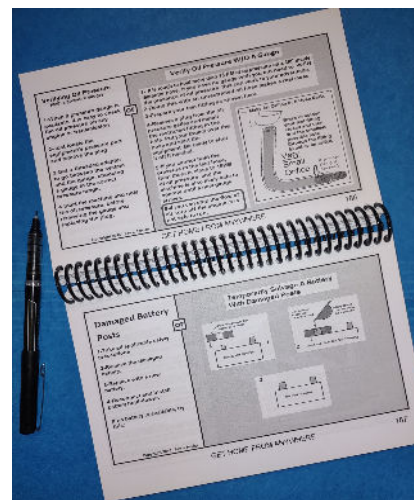
*The Grey Seas Under* - Farley Mowat

*ST 9-189 Metal Body Repair and Blacksmithing*

*FM 55-501 Marine Crew Members Manual*

## Course Text: *Get Home From Anywhere!* (GHFA!)

This 321-page book contains experience gained over Ben Evridge’s 52-year career doing heavy equipment repair work throughout the northwestern US and Alaska, as well as information gleaned from hundreds of interviews with skilled workers.



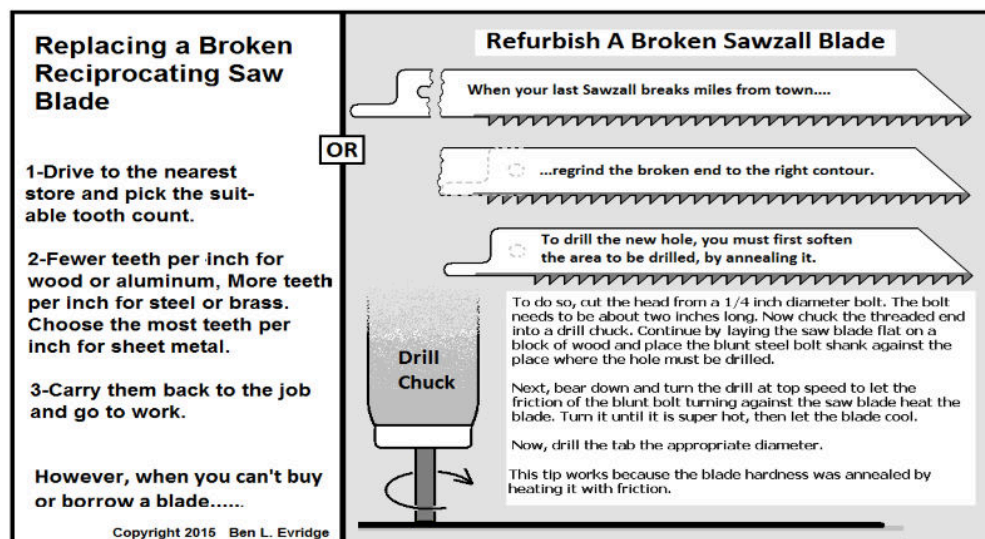
## Our Approach to Learning Problem Solving

Most of the material presented is peculiar to the skilled trades and is technical by nature. However, there is no need to worry if you are not familiar with all of the technical content found in our one-page summaries of GHFA. For now, just consider the creativity involved in the summary. You'll gain deeper technical know-how through independent study later on, after this seminar.

Let's now begin getting familiar with the course content and how it will be presented.

### Example: Repairing a Broken Reciprocating Saw Blade

Shown below is a graphic from our course text, *Get Home From Anywhere!*, along with a summary of how to interpret it.



Most often, when we break a saw blade, it is easy enough to get a new one. The left-hand column of these graphics always shows the preferred method. In this instance, it's also what we would find in the sawmaker's documentation.

However, if you must cut and splice a fuel line in a boat that is a hundred miles offshore during a howling storm, there is a new dimension to breaking your last saw blade. You may have noticed the small box in between the columns that contains the word "or." This means that the right side offers an alternative solution. Let's explore this alternative fix that keeps equipment going.

There is more to this summary than first meets the eye! As you can see, a new hole needs to be drilled in the saw blade. But, wait a minute...we first need to identify the saw blade as tempered high carbon steel. Since this is the case, we need to anneal the area to be drilled without ruining the temper of the cutting teeth of the blade. This means that we have to apply closely localized heat, only to the area that needs to be drilled.

Fortunately, gunsmiths have an effective approach to doing this. Using a drill, they spin a blunt steel rod against the area to be drilled, while bearing down to cause high friction and heat the blade. Once the area turns blue, it is soft enough to be drilled. The repair is finished by grinding a new contour on the previously broken end of the blade.

Of course, replacing a broken reciprocating saw blade requires metalworking knowledge, as well as skill in general. Now, let's take a look at the ideas and skills needed to engage in creative problem-solving as it pertains to this particular situation. These are the specific processes and skills that are being used:

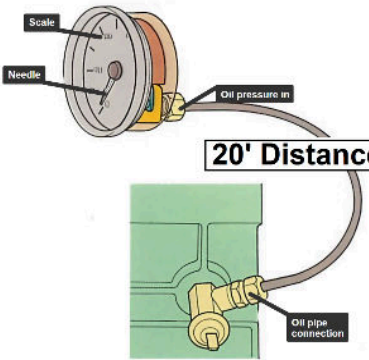
- 1-Identifying the saw blade material as heat-treated steel.
- 2-Abrasion; grinding a new tang on the end of the saw blade.
- 3-Annealing only the area to be drilled using heat.
- 4-Producing the localized heat by friction, using a blunt steel rod in a drill.
- 5-Drilling a new hole of the correct size in the now annealed section of the blade.

As the above example shows, every new skill we add to our mental toolkit greatly expands our creative capability. Effective problem solvers are well-versed in the factory documentation of marine equipment and tools, as well as many other areas of knowledge.

Remember: this course is about developing a problem-solving mindset rather than the nifty tips and tricks that are used as examples. As participants leave the seminar, they will be more able to apply the same creative problem-solving that keeps machines going, bringing everyone home safely.

### **Example: How To Enable Mechanical Oil Pressure Gauges To Work Well in Severe Cold – At a Distance**

This next concept came to me through an Alaska bush pilot. He described trouble getting mechanical engine oil pressure gauges to work accurately in severe cold. He advises filling the tube from the engine to the pressure gauge with diesel fuel.

<p><b>Gauges and Instrumentation</b></p> <p>Electric gauges, which require their accompanying senders, on the other hand are simple to install and repair.</p> <p>The oil dipstick is also a form of instrumentation, although rather basic.</p> <p>Mechanical gauges for oil pressure, coolant temperature and many other functions are simple and durable, and easy to install. However, on long runs, such as a large boat, when the engine is a long way from the wheel house, it takes a special approach.</p> <p>Copyright 2021 Ben L. Evridge</p>	<p><b>Using Mechanical Pressure Gauges At Great Distances In The Cold</b></p> <p>Alaskan Bush Pilot Ed Richter recommends filling the line between the engine (or transmission) pressure source and the gauge, with diesel fuel, before connecting it to the source of pressure.</p> <p>This helps the gauge respond much more quickly in the cold.</p> 
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Because the fuel viscosity is far lower than engine oil, it makes the oil pressure gauge much more responsive to changes in engine oil pressure.

Again, we start in the left column, but if conditions aren't right to apply this knowledge, we move to the right side for an alternative solution. Notice that the box in the center of this particular example contains the word "and." This means that the right-hand column complements the left hand column, just adding more possibilities to the accepted method on the left.

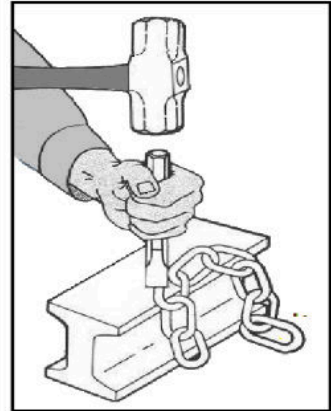
The list below calls out the skills, concepts, and materials that come together to solve this particular problem shown above.

- |                     |                          |
|---------------------|--------------------------|
| 1-Hydraulics        | 2-Fluid dynamics         |
| 3-Pressure          | 4-Viscosity              |
| 5-Threaded fittings | 6-Copper tubing          |
| 7-Plastic tubing    | 8-Cold weather operation |

### Example: Cutting Metal Without a Saw

Two hundred years ago, blacksmiths cut metal with either a chisel, or by laying the metal against the corner of an anvil and hammering it to part (cut) the metal.

While we now have many modern methods to cut metal bars or rods, it's good to remember the following technique:

<h3>Cutting Metal</h3> <p>1-Take all safety precautions. This includes eye and hand protection.</p> <p>2-Wire cutters, a torch, slip-joint pliers, plasma cutters and grinders work very well to cut metal.</p> <p>3-Harder metals must be cut with a plasma machine or a grinder.</p> <p>The tip at the right was first used by blacksmiths:</p> <p>Copyright 2015 Ben L. Evridge</p>	<p>or</p> <h3>Cutting Metal With A Hammer And Chisel</h3> <p>1-Most metals can be cut with a hammer and chisel.</p> <p>2-If there is no chisel, lay the piece to be cut against a sharp edged piece of steel to part it.</p> 
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Now you are getting used to the format! Again, we start at the left side, and if those conveniences aren't available and the chips are down, just shift to the right-hand side and carry on.




Notice the knowledge and skills involved in creating this solution:

- |                               |                         |
|-------------------------------|-------------------------|
| 1-Identification of materials | 2-Strength of materials |
| 3-Metal working               | 4-Cutting               |
| 5-Kinetic energy              | 6-Impact                |

### Example: Staying Safe Outdoors When It Is Impossibly Cold

During our time in Alaska, we learned how to keep safe if stranded in bitterly cold weather. We have slept out in this kind of shelter at -35°F.

<p><b>Preparing To Be Out For Extended Periods In Cold Weather</b></p> <p>1-Be sure you are in good physical condition.</p> <p>2-Make note of the weather forecast.</p> <p>3-Prepare for the unexpected by taking extra clothing, food, water, and something with which to build a fire.</p> <p>4-As a rule cotton clothing will let moisture and water more quickly dissipate body heat than wool and synthetic fibers. such as a large boat, when the engine is a long way from the wheel house, it takes a special approach.</p> <p>Copyright 2021 Ben L Evridge</p>	<p><b>Learn How To Build A "Quinzee" Snow Shelter-Practice Before You Need It</b></p> <p><b>&amp;</b> A-Trample throughout a circle six feet in diameter.</p> <p>B-Scoop and push snow from outside the circle to a height of at least 4'.</p> <p>C-By the time it reaches 4' in height, the relative heat from the frozen ground will move upward through the snow pile and harden (sinter) the pile.</p> <p>D-Next, make a small opening and dig in under the pile on one side.</p> <p>E-Leaving the walls and ceiling 8" thick, hollow-out the shelter.</p> <p>F-Scrape the floor as bare of snow as possible.</p> <p>G-If possible lay tree branches on the floor. This will further slow heat loss.</p> <p>H-Poke a 2" diameter air vent in the side of the shelter, 12 inches below the top of the inner dome ceiling.</p> <p>I-Partially, but never entirely, block the entrance opening. There must be air flow!</p>  <p>Irene and Ben - Kodiak, Alaska - 1995</p>
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The concepts underpinning this one-page summary are as follows:

- |                                |                       |
|--------------------------------|-----------------------|
| 1-Strength of materials (snow) | 2-Very cold locations |
| 3-Heat transfer                | 4-Abrasion            |

As the seminar progresses, we will work through numerous slides like these above. We will point out the background material to each one as we move from one *Get Home From Anywhere* story to the next. Eventually, we'll let you try your hand at it!

## Let's get back to how resourcefulness scales...

During WWII, the Nazis captured France and hijacked the production of the Citroën Motor Company to build trucks for the German war effort. Citroën president Pierre-Jules Boulenger had a problem to solve: how could he keep his workers safe from harm while resisting the German occupation?

His clever solution was to change the specification of the engine oil dipsticks. His new dipsticks had the oil "full" mark lowered considerably so that the engines held much less oil than needed.

The new trucks would leave the factory running perfectly. However, on steep hills that were far from the factory, the engines would fail from oil starvation. The failures were not traced back to the modified

dipsticks. By this bit of creativity Mr. Boulenger kept his people safe while at the same time resisting the Nazi war effort.

## Gamification To Learn Problem Solving

Gamification is defined as a way to learn how to do non-gameplay tasks by turning the learning process into a game where the score is kept and progress is measured. In this way, safe experimentation is encouraged and the fear of failure is reduced.

We all use gamification to some degree by keeping an internal score of how we are doing on different tasks. Fitness trackers keep score on our steps, allowing us to participate in a game against ourselves, thereby motivating us to do better – or at the least, to hold our own. Beyond the upbeat measure of our fitness, gamification has much more utility in improving our performance when performing more difficult tasks.

One common form of gamification is the aircraft flight simulator for pilots. It is done with a physical mock-up of the cockpit for practicing and gaining the necessary skills without the threat of anyone getting hurt.

For athletes, emergency responders, public speakers, musicians, and soldiers, ongoing practice and “play” are done where progress is measured under non-threatening conditions.

Practicing a procedure a hundred times while knowing you won’t be hurt makes it a game at some level in your thinking. This lets you do your best work when real life presents more risky situations.

## Participant Problem-Solving Example

When it becomes time for our participants to apply their own creativity, this is the format that will be presented.

**Here’s the situation:** You are miles from nowhere, doing a critical repair job that requires the cutting of several two-inch holes through 1” thick plywood.

To your dismay, you discover that the largest hole saw you have with you has a diameter of only 1- $\frac{3}{4}$ ” inch. You do have a pocket knife with you, as well as a round wood rasp. Given time, either of these would enlarge the holes. However the plane is scheduled to pick you up tomorrow for the return trip home. What to do?

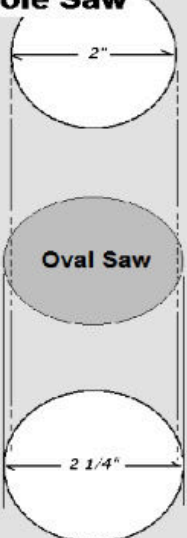
<p><b>Obtain The Ideal Hole Saw</b></p> <p>1-When purchasing a hole saw remember that they come with either fixed or replaceable arbors. (An arbor is the center piece that connects the drill motor chuck to the saw body.)</p> <p>2-Better quality saws have replaceable arbors, so that one arbor will fit several diameters of saw.</p> <p>3-Also important is that the best saws are bi-metal construction, with the cutting teeth being very high quality steel.</p> <p><small>Copyright 2015 Ben L. Evidge</small></p>	OR	<p><b>How To Cut A Larger Hole With a Hole Saw?</b></p>
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Take a few minutes now and consider how best to handle the situation. Jot down your approach.

During the actual seminar, participants will keep score, rating their solutions on a scale between 1-10 to monitor their progress. They will report whether they were more limited by a lack of creativity, or a lack of technical skills.

It is true that the best thing to do is always have the holesaw or tool you need with you! In this example, that is not possible – but the job still needs to be completed. So, put on your thinking cap...

Here is one possible solution:

<p><b>Obtain The Ideal Hole Saw</b></p> <p>1-When purchasing a hole saw remember that they come with either fixed or replaceable arbors. (An arbor is the center piece that connects the drill motor chuck to the saw body.)</p> <p>2-Better quality saws have replaceable arbors, so that one arbor will fit several diameters of saw.</p> <p>3-Also important is that the best saws are bi-metal construction, with the cutting teeth being very high quality steel.</p> <p>Copyright 2015 Ben L. Etridge</p>	<p><b>Cut a Larger Hole With a Hole Saw</b></p> <p>Any hole saw will make a larger hole than it was designed to cut. If no larger saw can be obtained and you must make a larger hole, just squeeze the holesaw in a vice to make it oval instead of round. This will make the "kerf" wider, and the hole will be larger. After the emergency is over, careful work with the vise will again make the saw "near round".</p> 
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Ben, a presenter in this seminar and author of *Get Home From Anywhere*, worked for decades before this idea occurred to him. It's true that an oval hole saw cuts a wider kerf and takes more power from the drill while doing so. The beauty of it is that you can have any diameter hole within the range of a given hole saw. The concepts and skills used here are as follows.

- 1-Metal working
- 2-Tool making
- 3-Cutting
- 4-Swedging (bending or collapsing metal)
- 5-Kerf (the width of the cut material that is lost to sawdust)



Are you ready to learn more about keeping your equipment going so that you will Get Home From Anywhere?

Contact Ben to schedule a two-day **Get Home From Anywhere!** seminar at your facility by emailing [info@virtualdiesel.com](mailto:info@virtualdiesel.com).

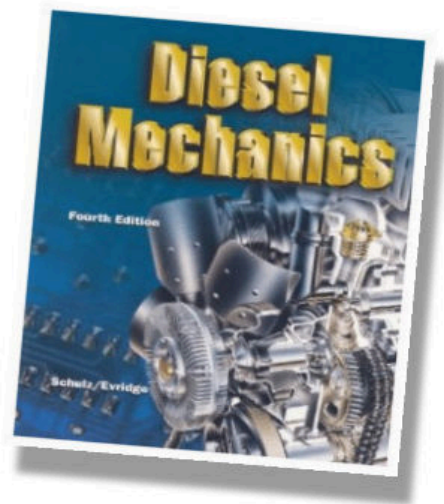
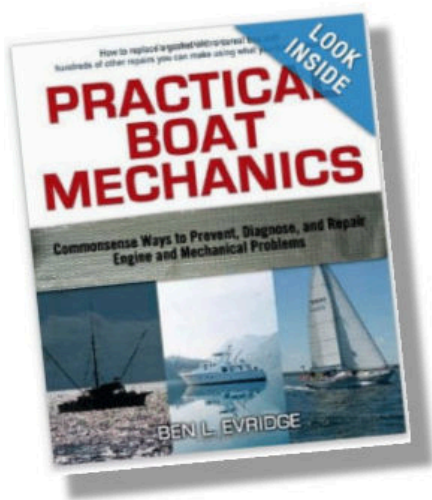
We look forward to showing your people how to gain the troubleshooting mindset required to keep your machinery going under the toughest conditions.

Ben Evridge

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