

## Why Do You Rig The Way You Do?

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### Introduction

There are many ways to solve most rigging problems, which forces riggers to confront a problem every time they rig. Of the many ways to rig, which way do you choose when faced with each unique rigging challenge? How this question is answered is individualistic and based on each person's rigging philosophy. A rigging philosophy is a system of thought that a rigger uses to view and perceive a rigging problem, organize the information they observe, form an action plan, prioritize actions, and implement the rigging they have decided to perform.

All riggers have some personal philosophy about how to rig, though it is often subconscious, unconsciously applied, or poorly thought through. Having an incomplete, illogical or incoherent personal rigging philosophy can slow decision making during real rescues, or during training. As a result, it is practically useful to consciously think through what our personal and agency rigging philosophies are so that rescuers know what variables to consider and in what priority order.

One characteristic of a mature and seasoned rigger is they can often articulate their rigging philosophy and back it up with sound reasoning, research data, and practical (empirical) experience. Consequently, it is useful to consciously develop a rigging philosophy and consider ways of helping new riggers develop their own rigging thought to more quickly move them through more advanced stages of rigging thought. Having consciously thought through rigging variables in advance will speed up rescue responses and minimize the insidious appearance of the "Good Idea Fairy". Therefore, a practical result will be realized from an intellectual endeavor!

To facilitate readers developing their personal rigging philosophies, or to help agencies develop theirs, this article with review some of the most important variables to consider in rigging. It also provides a though experiment that can be used to test the philosophies you developed. A scenario is provided with an example solution that includes a discussion of the driving rigging philosophy.

**Note:** The personal rigging philosophy expressed in examples here is the present philosophy of the author and is intended as an example only. Readers can and should disagree with the relative priority of some of the choices and values espoused by the author. No judgement of other's rigging philosophies is intended or implied by the examples used here. It is acknowledged that rigging philosophies can and should change, so the author's philosophy will continue to evolve with time, data, and experience. So should yours and any agency you are affiliated with.

### Philosophy: Who Needs It?

The word "philosophy" literally means the love of wisdom or knowledge and can seem like a functionally useless concept to people of action (like most rescuers). Who wants to sit around pontificating about how and what we think when we can simply rescue someone! However, every action you take is governed by some way in which you perceive and interpret the world. In other words, everyone is living a personal philosophy whether or not they consciously think that knowing their philosophy is useful or not! So, the question should not be, "who needs a rigging philosophy" but rather "how can I improve the rigging philosophy I already have and use". Therefore, assumed here is that everyone has a rigging philosophy of some kind, and that each philosophy can and should be consciously and actively improved.

Philosophy is commonly divided into four sub-disciplines: metaphysics, epistemology, ethics, and logic. Metaphysics deals with the fundamental nature of the world (not discussed here), epistemology covers the nature of knowledge about the world, ethics is about human morality, and logic is the study of reasoning. Included in this discussion will be some epistemology, ethics, and logic. Each are discussed in a simplified framework of rigging rather than academically. However, some basic principles are covered here as a base line.



Epistemology: All riggers should adopt a *growth mind set*. In other words, the rigging endeavor is complicated enough that we all could be incorrect in our beliefs, so it is important to constantly re-evaluate what we think we know and why. We should learn from our mistakes whenever possible.

Ethics: Rigging should, whenever possible, *maximize patient care and minimize risk to rescuers*. In other words, there are competing variables of how the patient is treated and what the rescuers experience. Whenever possible maximize patient outcome while reducing risk to rescuers.

Logic: Explicitly advocated here is an *evidence-based* approach to rigging. In other words, rigging decisions are based on research data, not just speculation, gut instinct, SOP/SOG, or other explanation (e.g., we have always done it this way!). Remember, “experience” is a type of data, it is observational data.

### **Rigging Variables**

When riggers and trainers discuss their rigging, they frequently focus on a few concepts and ideas, therefore these are the important concepts to focus on when covering rigging philosophy. Here these ideas are called “variables”. These are the parts of the rigging system that can be manipulated to change outcomes.

Fundamentally we are performing a cost/benefit analysis with each variable to determine which variable is most important within our rigging context. Many disagreements between riggers can be boiled down to disagreements in the cost/benefit analysis between these variables. Therefore, a way to develop more tolerance and understanding in the rigging community is to understand how the users rigging environment changes the mental calculus for each variable.

Several rigging variables are discussed here while acknowledging that some relevant variables have probably been missed. The intent is not an exhaustive list, but a good enough list is generated so a cogent discussion of rigging philosophy can be initiated.

1. Safety: Those engineering rescue systems can choose how much safety they will build into a system. This is really a value judgement that ranges from completely bomb proof rigging with no potential of any failure, to not caring about the safety of the patient or rescuers at all. This is about risk tolerance, with some being completely risk averse, to others ignoring risk entirely. Systems can also be rigged so “safe” that they stop working or it takes hours to rig them, thus slowing patient extrication and care.

Consequently, there also can be a practical tradeoff between safety and functional rigging as well.

*Author’s Personal Rigging Philosophy*: Rigging systems should be rigged *safe enough*. That means the rigging is engineered for failure modes that are possible rather than theoretical, and the amount of safety incorporated in the system does not reduce functionality or prevent the system from operating in a timely manner.

*Example #1*: After a highly publicized accident where a mountain guide fell to their death while relying on a water knot (NPS Search and Rescue Report, 2017), some rescuers insisted that all water knots needed backup knots in the tails. However, the research by Moyer (1999) clearly shows that a correctly tied water knot with 2 to 3-inch tails does not need backup knots because, once loaded, rescue systems do not experience cyclical loading. In other words, the failure mechanism some rescuers were expressing concern over does not happen in rescue contexts. Therefore, I do not back up my water knots, because I tie them with long enough tails, inspect them, and I am not concerned about a failure mode that does not occur in my practice.

*Example #2*: When rigging around waterfalls I often choose not to rig a belay line because the air currents around waterfalls frequently cause the load to spin. In some cases, having the belay line fouls up the system, preventing it from operating, because the two ropes become twisted. When operating with only one rope, I ensure there is no way to cut or damage the rope to prevent the worst-case scenario from occurring.



2. Patient Care: Patient care can also be viewed on a spectrum of providing little to no care, all the way to providing superlative care with the most expensive equipment, highest trained medical personnel, and provided rapidly. For rescue volunteers and professionals, we often provide the level of medical care we can, given budgetary constraints, the personnel available, and the environment.

*Author's Personal Rigging Philosophy:* We should provide the best patient care we can, which often means getting the patient moving out of any hostile environments. As in, providing traditional urban quality medical care can often be secondary to getting the patient to a location where they can receive professional medical services, and out of an environment that could kill or continue to harm the patient. This is most important in a back-country rescue context, and less important in an urban medical context. Also, it is exceptionally rare to provide quality patient care while hanging from a rope, so it is often more expedient to get the patient off a rope, if they are hanging, rather than provide extensive patient care while suspended.

*Example:* Because patients in the backcountry need to rapidly get to definitive care, I will frequently choose to move my patients in litters vertically rather than horizontally. Vertical litter orientations are much easier in edge transitions, have less rock fall risks to patients, etc., so they are often much faster. However, I will only do this if the patient can tolerate it. For most backcountry accidents, most patients can handle going vertical for a few minutes, which ultimately gets them to care faster.

3. SOP's/SOG's: Rescue agencies often develop Standard Operating Procedures (SOP's) or Standard Operating Guidelines (SOG's) as a means of ensuring all their personnel know the same techniques, and that those methods are safe and effective. This is often a way to minimize training costs because training a versatile competent and qualified rigger takes a lot of time while training all personnel to a minimum standard can be much easier to achieve. In addition, it is a way to handle some of the legal liability issues associated with the complex rescue environment.

*Author's Personal Rigging Philosophy:* My rigging context is in the backcountry either in caves or canyons. As a result, SOP's and SOG's are not advised because each pitch is unique and requires using different techniques to overcome. As a result, I rely on a higher standard of personal knowledge and study rather than SOP's and SOG's to overcome my rigging challenges.

*Example:* I went canyoneering with a few new canyoneers, and we reached an obstacle that was not described in the route description (we speculate the canyon had changed in the preceding two weeks where there had been some heavy storms). We had already pulled our rope, so we were committed to overcoming the obstacles in front of us. The rest of the party rappelled off me, and I used a combination of the sketchiest of anchor I have ever used, and a lot of friction, to perform a rapid semi-controlled slide down a 30-foot pitch. The anchor did fail (as expected, it was exceptionally bad...), and the last few feet I had a sporting ride (fall). We returned home happy, healthy, and with a renewed appreciation for bringing a small bolting kit, just in case. Had we relied on simple standard techniques, I would have been stuck in that location for hours while my party exited the canyon, called for SAR, they arrived, and they extricated me. What I did was save time, reduce risk (not exposing rescuers to a hazard), and prevent the need for a callout rescue. All based on learning how to creatively solve rigging problems.

4. Equipment Cost: This variable is obvious; equipment can run the spectrum from incredibly expensive to cheap. Usually the deciding factor is the budget of the person or agency doing the purchasing. Often individuals can afford much less than agencies can, so frequently agencies have more expensive and plentiful equipment than individual riggers.

*Author's Personal Rigging Philosophy:* Professionally I am an educator, so I am constantly poor. *I only buy equipment when it serves a specific function or functions.* I research the equipment in detail, then purchase the item I need for the lowest cost I can find. *I do not sacrifice functionality for price,* however. My life is worth the extra money!

*Example:* When in the vertical environment I like to have an extra two rope grabs in case I need to build an ascending system or haul system. Rather than pay for a couple small rope grabs, like a Tibloc or Ropeman, I prefer small loops of accessory cord so I can make prusiks, or some other friction hitch. A



toothed rope grab like a Tibloc or Ropeman is considerably more expensive so is harder to afford on a teacher's pay.

5. Personal or Organizational History: Rigging decisions are based on the experience and knowledge of the rigger or riggers. What they have seen, heard, read about, experienced in trainings, all color their version of reality. Consequently, how a person or team engineers and builds rescue systems will be a function of their history. That history can be one of stagnation, with very little change over time, one of rigging experimentation and exploration, and everything in between. This history might also be shaped by strong, and often colorful, people and their opinions. A frequent comment made is "That is the way we have always done it". This comment indicates a history where SOP's and SOG's have been used and not frequently updated. You can actively control your history by intentionally encouraging active study, experimentation, and questioning of existing practices. Over time this leads to a history where the methods used have been subject to scrutiny, even if they have been maintained over time. By implementing a growth mentality and evidence-based decision making you can create a personal and organization history that favors progress when evidence indicates a change would be useful.

*Author's Personal Rigging Philosophy:* I practice and advocate active study and research to improve my personal rigging knowledge. Similarly, I practice frequently to maintain my personal skills. This has given me a history of experimentation, odd experiences, and an appreciation of what I do not know.

*Example:* I was originally trained to use wrap three pull two webbing anchors because they were so much stronger than other anchors. Ultimately, further research showed that this idea was wrong. This forced me to update my rigging philosophy, and now I use any situationally appropriate webbing anchor that clips two strands of webbing. Because all the anchors with two or more strands show similar strengths (Evans and Truebe 2015), this provides me maximum situational versatility while giving me safe enough systems.

6. Rigger's Knowledge/Training Demands: Those performing a rescue could have decades of training and experience while others may have little to no training whatsoever. What techniques and equipment are used will be based on what the riggers know. This can be affected by training, with greater training often yielding a larger rigging toolbox. Those riggers with greater knowledge can adapt more quickly to unique and variable rigging problems.

*Author's Personal Rigging Philosophy:* I lean toward developing a diverse rigging toolkit and using this learned versatility to overcome rigging obstacles. I find knowing more enables me to do more with less, and I can accomplish more with less help (fewer people helping during a rescue).

*Example:* When I first started rigging, I was trained in callout rescues, so I could help move a patient up and down a vertical obstacle if I had help from 4 or 5 others. As I have learned more techniques (e.g., inline traveling hauls and counterbalances), and practiced my on-rope skills, I can perform complicated rescues by myself, both with and without litters. Consequently, now I prefer performing rescues with fewer people of higher training standards, because we can get the job done faster, more efficiently, and with less communication (and miscommunication!).

7. Speed: Rescues can be performed with very little thought toward how much time they take (e.g., body recoveries), or can be governed by the urgency of the patient's injuries. In urban contexts time is not as much of a factor as in backcountry rescues, because medical facilities are closer. Smaller injuries can be fatal in the backcountry because the transport time out of the environment alone could kill the patient.

*Author's Personal Rigging Philosophy:* Nearly all patients could benefit from getting to definitive care faster, so I lean toward faster rescues rather than slower. I am not advocating slapdash, but being able to rapidly assess a problem, identify a solution, build it, operate the system, and move on. This problem is more acute in backcountry settings where the environment may also kill the patient. In these cases, it is more important to get the patient out of the environment because further damage to the patient can result if they stay in an unforgiving environment (e.g., on a mountain, in a cave, etc.).



*Example:* A climber fell and gravely injured themselves on a popular climbing route. A single skilled rescuer climbed to the patient, provided what little medical care they could, then started rappelling with the patient using a single rope. The patient was lowered 4 pitches using this technique before the fire service showed up and halted the rescue. They had the rescuer stop where they were and wait for a second rope (a belay) to be provided. Had the rescuer simply completed the last two rappels with the patient, they would have been in the back of an ambulance in 15 minutes but waiting for the second belay rope stalled the rescue for hours. Getting to the hospital quickly was in the best interest of patient care, but the rescue was stopped based on somewhat dubious safety concerns given the good weather, experienced and knowledgeable rescuer, and the demonstrated success of the techniques used.

**8. Equipment Mass:** Some rigging environments are difficult to access physically. For example, mountaineering, canyoneering, or caving, all pose physical barriers to getting equipment to a rescue location. As a result, equipment mass is a factor in if rescuers will purchase and carry it. For some it is a safety hazard; heavier equipment saps energy that will later be used to survive in a hostile environment or perform a rescue. So, carrying heavy gear can even be detrimental in some cases. Therefore, riggers and agencies must decide if there is an access problem that will restrict the use of some equipment. Commonly this division is urban rescue versus backcountry rescue. For those in the backcountry the mass of gear items can be definitive.

*Author's Personal Rigging Philosophy:* Most of my rigging takes place in caves, canyons, and on cliff faces away from civilization. Therefore, I tend to carry equipment that is light, small in size, and highly versatile.

*Example:* While caving or canyoneering I will happily carry an HMS carabiner and a small pulley to perform rescues, but I will not carry an MPD. It is simply too heavy, and the environment too strenuous for me to burn so many calories carrying a heavy piece of equipment that provides comparable operational characteristics to a Supermunter and a counterbalance.

**9. Equipment Volume:** Some vertical environments are tight spaces in which not all equipment can fit. For example, caves, some canyons, and confined spaces in urban rescue contexts. In these environments it is more important to have smaller equipment rather than larger equipment purely because it fits! This is a unique constraint, but for those that rig in confined spaces, equipment size can be vitally important.

*Author's Personal Rigging Philosophy:* Most of my rigging takes place in caves, canyons, and on cliff faces away from civilization. Therefore, I tend to carry equipment that is light, small, and versatile.

*Example:* Cave rescue is unique because we often do not have high help when performing an edge transition with a litter. Often the passage geometry does not allow us to bolt or use an artificial high directional. As a result, we must use edge transition techniques that do not require extra equipment to perform. So, our rigging often does not rely on tripods, bipods, or monopods because we simply do not have the space for them!

**10. Equipment Versatility:** Some equipment is designed and built for a specific function or functions. For example, screw links are fantastic connectors between two things, but that is nearly all they can do. However, other devices have considerably more versatility. For example, HMS carabiners can clip one or many items, can handle operating a Munter Hitch, have a large gate opening, and they can perform nearly every function another shape of carabiner can. Some equipment is simply more versatile, which can be important, particularly for rescuers who can take limited equipment to their rescues. Backcountry rescuers are often carrying limited equipment out of necessity and need gear that can serve many functions, so they can overcome whatever rigging challenges they face. This is a much smaller problem for urban rescue where trucks can be driven to rescue locations and gear is moved only short distances to the rescue location, making equipment optimized for one function more desirable.

*Author's Personal Rigging Philosophy:* Most of my rigging takes place in caves, canyons, and on cliff faces away from civilization. Therefore, I tend to carry equipment that is light, small in size, and highly versatile.



*Example:* When entering a vertical environment, I like having some device with me that can lower a two-person load, just in case. Therefore, I nearly always carry at least one full sized HMS carabiner. Coupled with a knowledge of Super Munters and Zuper Munters, I can easily control a two-person load lower with this one simple device (Richard Delaney 2014).

## **Example Rigging Scenario and Rigging Philosophy Explanation**

### Scenario:

You are called to respond to an injured patient. When you arrive, the patient has fallen and rolled down a steep rocky slope and is laying at the base. Upon access to the patient you find she is alert and oriented, has many bruises and scrapes, but no other external injuries. She is young and fit, and describes the accident as her out for a run and slipping on some gravel at the side of the road. Her complaint is a dislocated shoulder, but otherwise she feels fine. A secondary exam reveals nothing abnormal; including no pain along her back and neck.

The day is sunny and warm, with no weather rolling in. The hill slope is steep enough that rappelling is necessary in a couple of locations, including a short 6 foot free fall. The slope/cliff does not have any substantial vegetation, but it is a long cliff band that extends for miles.

### Author's Rigging Solution:

I would rig the pitch with an inline traveling haul where the medic operates the haul from below, and the patient resets the haul with her uninjured arm. If a belay rope is available, a belay would be provided from above and would be a locking hitch (e.g., a Garda, or Lorenzi Hitch, etc.). The belay would be kept taught by someone pulling from above, thereby creating a two tension system. If the patient needs help while on the pitch, the rescuer can ascend a third rope and provide care as needed.

### Rigging Philosophy Justification:

The most important variables in this problem are patient care and safety. The patient needs access to definitive care, so it is in her best interest to get her moving. Without spinal injuries she does not need to be in a litter, which also speeds up the rescue. Therefore, using the existing rigging is expedient (the access line). The existing access line can be used to haul her up the pitch with very little extra equipment. An inline traveling haul is fast, efficient (there is no edge friction, and the hauler at the bottom can apply up to their body mass in force), and it is safe. A belay can quickly and easily be applied in the form of a locking hitch with a second rope. If the patient needs any extra assistance up the pitch, the rescuer can ascend a third rope and provide any needed care. With such good access providing the three ropes is easy, and by putting only a single person load on each rope, the system has a higher safety margin.

## **Strategies For Teaching Rigging Philosophies And Critical Thinking**

There are three common strategies to teaching any philosophy and the complimentary critical thinking skills: 1. Direct Instruction, 2. Modeling, 3. Practice with Timely Feedback. Each are discussed in turn.

Direct instruction is simply teaching students the philosophy you want them to have. This can be performed through lecture or reading. While this is the least effective method of teaching the material, it is, practically, the first method that will be applied.

Modeling is performed in two ways. First, provide students with hypothetical rigging scenarios, then verbally explain your thinking as you solve the problem in front of the students. This technique shows students how you want them to think and gives them an insight into how an "expert" thinks through a problem. Secondly, modeling is also accomplished by verbalizing the thinking process out in the field during training lessons and practice exercises. Students will see you are practicing what you preach, thus getting more buy in to the material you teach.

Practice with timely feedback is providing students a realistic rigging challenge and having them solve it. After they have solved the rigging problem, have students justify why they chose the equipment and techniques they chose based on the rigging philosophy you taught them. Provide immediate constructive feedback to correct any misconceptions, so they associate the thought task with feedback that further hones their thinking. Such exercises work exceptionally well as warm ups at the beginning of



trainings or meetings to get people thinking. This technique will also work in the field. Simply provide a rigging problem for students, have them solve it, and explain why they solved it the way they did. Once they have explained why they chose the solution they did, provide any corrective feedback desired.

Here is an example rigging philosophy module for training a team. Spend an hour of training teaching and discussing rigging philosophy and end with one or two rigging scenarios coupled with immediate feedback. At the next few meetings, start the meetings with a rigging scenario with immediate feedback on student rigging solutions. The next time a field training is scheduled, start with a simple rigging problem, have students critique each other's rigging justifications, and provide any corrective instruction as desired. For volunteer SAR teams this will be easier to implement than many urban rescue teams, because volunteer teams often have fewer training demands.

## **Conclusions**

Each rigger and agency have rigging philosophies, consciously or unconsciously. It is in everyone's best interest to actively develop these philosophies to improve rescue responses. Because there are many "right" ways to perform a rescue, there are many "right" rigging philosophies. Each philosophy has its own strengths and weaknesses, so each person and agency will have to tailor their philosophies to their unique rigging environments. Ten rigging variables were discussed here to facilitate readers reaching their own conclusions about which variables are most important, and in what order.

Advocated here are three core beliefs: 1. All riggers (and agencies!) should adopt a growth mind set. 2. Rigging should maximize patient care and reasonably reduce risk to rescuers. 3. Rigging practices should be evidence based.

While the author's personal philosophy has been used to illustrate ideas, the same rigging philosophy is not advocated for all riggers. It has been used as an example but not an exemplar, so should not be considered an explicit endorsement of any of the value judgements I personally make. My personal philosophy has changed over time as my rigging context has changed and my knowledge base has expanded. Your philosophies can and should also change as you gain more skill, cognitive abilities and see more research data.

## **Acknowledgements**

For years I have been thinking about how to broach some of these ideas to the rigging community, and I was stuck in a rut. I could not figure out a non-confrontational and insulting way to broach some of these ideas. Then Russell McCullar showed me the way with his 2017 ITRS presentation. He stood in front of the ITRS attendees and expressed his rigging philosophy toward Munter Hitches and showed me the best example for how to handle potentially divisive issues. Thank you for your example! Without you this work would not have been completed.

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