Chapter 8: Three Main Components of a Rope Rescue System

Scope: This chapter serves as an orientation to the three main components of a rope rescue system.
Terminal Learning Objective (TLO): At the end of this chapter, the student will be aware of rope rescue system construction requiring the assembly of individual items (rescue rope and related equipment) into functional components.
Enabling Learning Objectives (ELO):
1. Define key points about the component approach
2. Demonstrate a single RPM configuration
3. Demonstrate a prerigged dual RPM system

The construction of rope rescue systems requires the assembly of individual items (rescue rope and related equipment) into functional components that when put together form operating systems. Traditionally these individual items have been stored and transported as a cache of equipment grouped by like items to the rescue scene. Rescuers then assemble these individual items into components, and then into working systems. At best, this is not a timely or efficient approach to bring to the rescue scene.

Grouping these individual items into component systems, and prepackaging them into a standardized system will greatly reduce set-up time and simplify the construction and safe operation of low angle rope rescue systems. Local and regional standardization based on this concept will help ensure smooth interagency operations of these types.

This manual identifies three main components of low angle rope rescue operations.

1. **Belay/Safety Line Component**
2. **Main Line Component**: Can function as a lowering line, raising line, or fixed line for rappelling.
3. **Mechanical Advantage Component**: Can be independent or part of the main line.

Key Points about the Component Approach

- ❒ The basic system requires two lifelines: one to support a belay/safety line component and another to support a main line component.
- ❒ These two components can each be preassembled and carried on an apparatus, ready to be put into immediate service.
- ❒ The belay/safety line component is the back up to all other components of any rope rescue system in the event of its failure. This line will be loaded only if there is a failure in the main line system.
- ❒ The main line component carries the load in all rappel, lower, and raise operations. The main line component will convert into a part of the mechanical advantage or haul line system depending on what type of mechanical advantage is constructed.
- ❒ A main line component that carries a collection of equipment that includes a descent control device, pulley, and load-releasing device with one or two prusiks is commonly referred to as a **RPM**. The **"R"** refers to resistance, meaning a figure of eight descender or brake bar rack. The **"P"** refers to a pulley. The **"M"** refers to a Mariner's hitch, an early form of load releasing device.

- ❒ The mechanical advantage component is the minimum equipment required to construct any of the mechanical advantage systems shown in this manual. This equipment is commonly carried in the main line component rope bag equipment pocket or a separate equipment bag.

Belay/Safety Component

Figure 8-1

Function: This component will provide fall arrest for rescuers and victims and shall be included in all systems. Staffing this component shall be the sole responsibility of a competent individual.

Minimum equipment:

- ❒ LRD
- ❒ Two carabiners
- ❒ One short prusik
- ❒ One long prusik

May be stand-alone or part of an RPM.

Main Line Component (RPM)

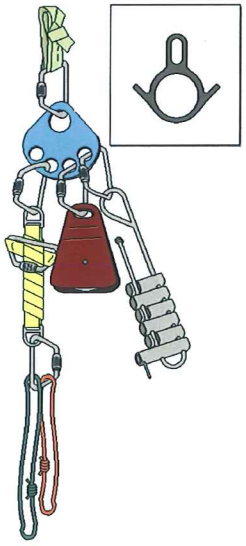

Figure 8-2

Function: This component will provide lowering capabilities for rescuers and victims during system operations. During lowering operations, the braking components (tandem prusiks) will be optional.

Minimum equipment:

- ❒ Anchor plate
- ❒ Descent control device
- ❒ Pulley
- ❒ LRD
- ❒ One short prusik
- ❒ One long prusik
- ❒ Five carabiners

Mechanical Advantage Component

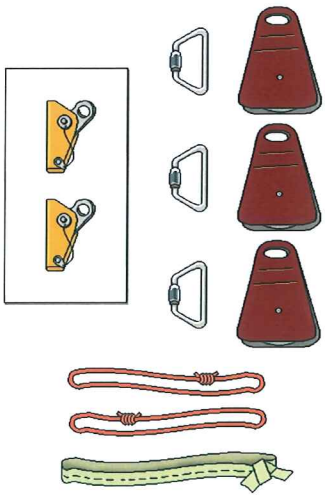

Figure 8-3

Function: To provide raising capabilities for rescuers and victims during system operation. During raising operations, the braking component will be required.

Minimum equipment:

- ❒ Three carabiners
- ❒ Three pulleys
- ❒ Two short prusiks or mechanical rope grabs
- ❒ One anchor sling (5' – 20') as needed

Supports the construction of 3:1 or 5:1 mechanical advantage systems.

Single RPM Configuration

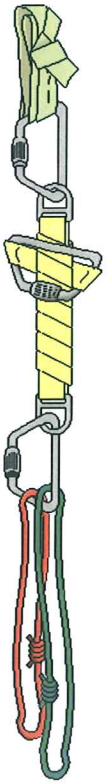

Figure 8-4: Single RPM Configuration Belay/Safety Line

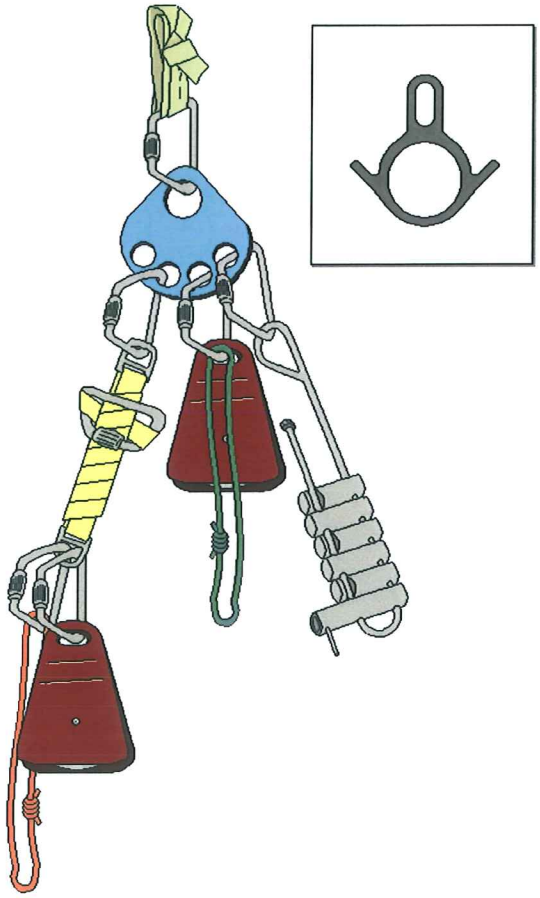

Figure 8-5: Single RPM Configuration Main Line

- Agencies that respond in more urban/structural environments often configure the RPM by attaching the equipment necessary to construct mechanical advantage systems directly to the collection plate. This simplifies operations in environments that provide larger operating distances between the main anchor and the working edge.
- Systems configured in this way minimize equipment needs and weight of systems utilized in high angle rope rescue operations.
- Although not specifically supported in this text, systems configured in this way are currently being used safely and efficiently in low angle rope rescue operations.
- **The instructor will modify the RPM configuration to best meet local and regional needs.**

Prerigged Dual RPM Systems

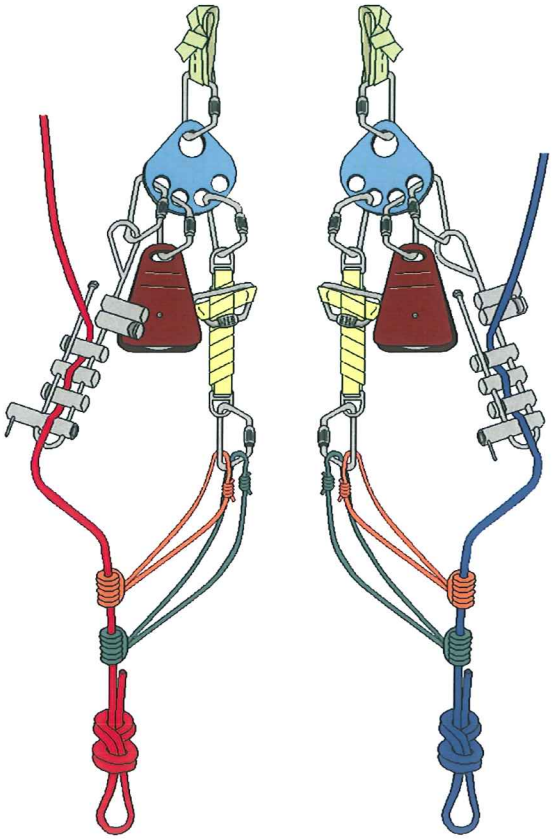

Figure 8-6: With Brake Bar Rack

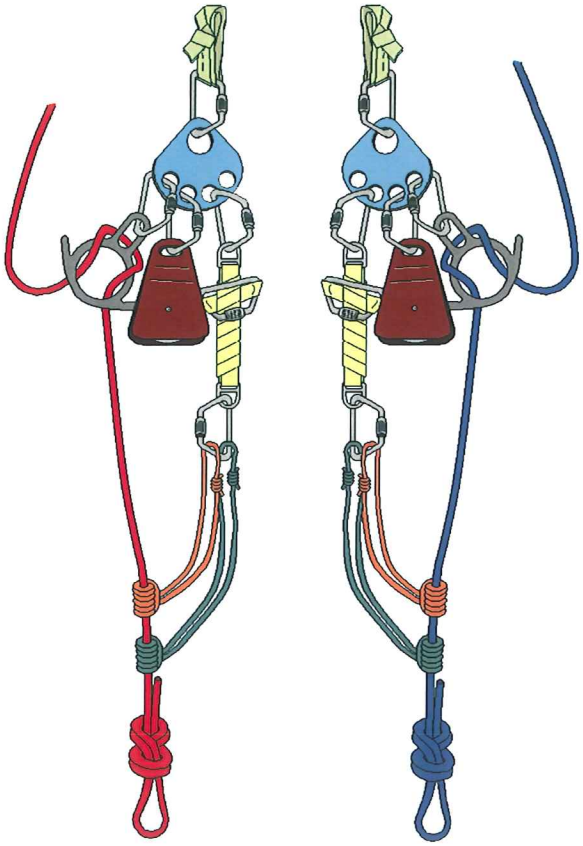

Figure 8-7: With Figure Eight Descender

- Prerigged dual RPMs with tandem prusiks are a common rural configuration where low angle rope rescue operations are most often, if not exclusively, utilizing a directional change pulley off the collection plate.
- When attached to anchors, the RPMs are configured with the load-releasing devices (LRDs) to the inside and adjacent as shown.
- This configuration is ideal for lower/raise operations in environments with a limited operating distance between the main anchor and the working edge. This is a common scenario in over the bank operations on narrow roadways.
- Either RPM can become the belay/safety or main line side of the system based on site specifics and operational needs.
- The equipment required for the construction of the mechanical advantage system is commonly carried in a pocket in one of the two rope bags, bagged separately, or preassembled and attached to a lifeline in a separate rope bag. (Figure 8-3)

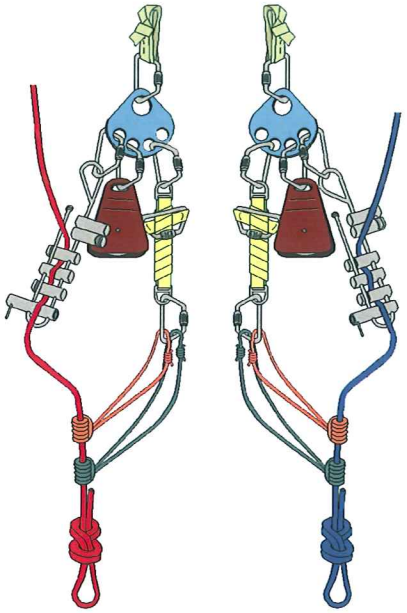

Figure 8-8: With Brake Bar Rack: As Stored

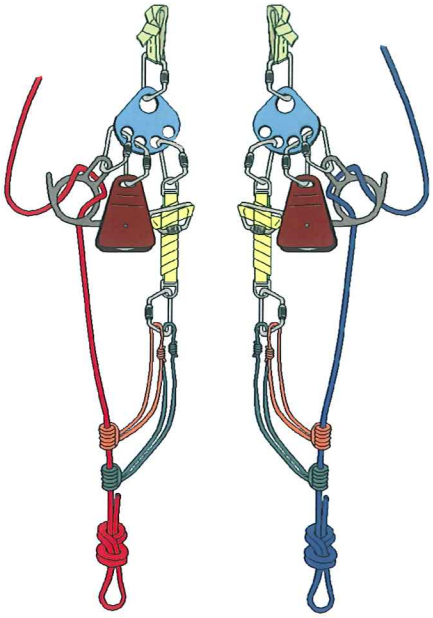

Figure 8-9: With Figure Eight Plate: As Stored

- ❒ Redundant RPM systems are stored in the configurations above.
- ❒ This allows for the use either as a belay/safety line or main line.

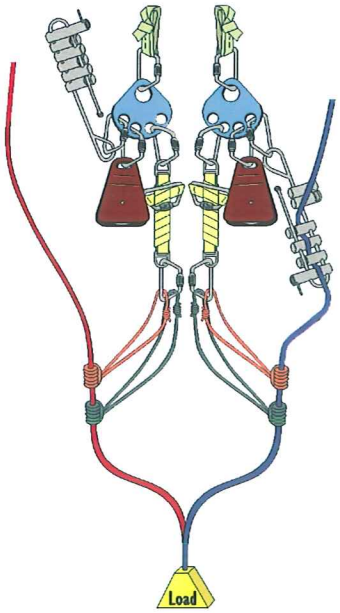

Figure 8-10: With Brake Bar Rack: In-service Lower

The main/lowering line tandem prusiks are optional during lowering operations.

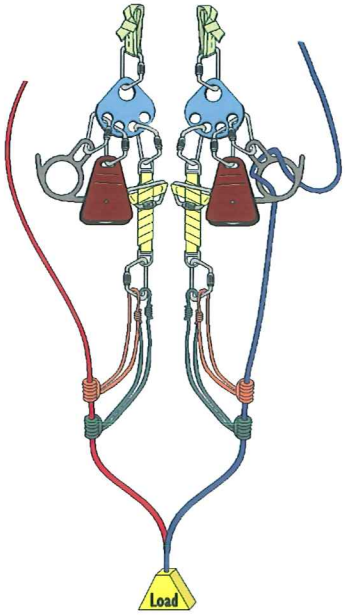

Figure 8-11: With Figure Eight Plate: In-service Lower

- ❒ To place the system in-service, the belay/safety line is removed from the descent control device.
- ❒ If the prusiks are left in-service for lowering, a main line brake tender is ***required***.