Philmont Bear Bagging System
Hook Details

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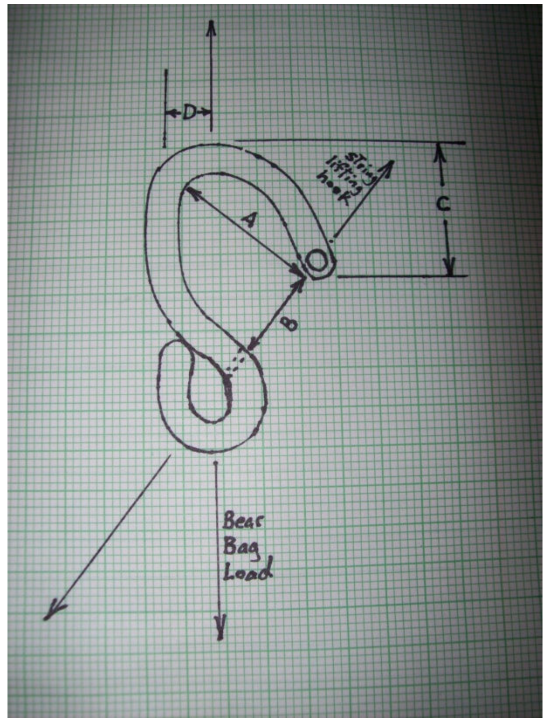

The key innovation in the Philmont bear bagging system we created for our 2009 Trek was a hook that has a special shape that allows it to hook onto the bear bag cable when lifted to the cable, can't unhook when loaded with the bear bags, but when unloaded can be easily unhooked and lowered to the ground. Figure 1 shows the key dimensions. Dimensions A and B are key for hooking, C and D are key for staying hooked, and the hole in the tip is key for unhooking.

Distance A: (Make large) When the hook is being lifted by the string it sits at an angle formed by the hole in the tip and the eyelet. Tilt paper till B is straight up and down to see how it looks and notice that the hook is tilted over such that it can hook on the cable easier. When the tip is just above the cable, (note that the cable will lie along A) the hook only touches the cable a distance A from the string. This causes a torque that rotates the hook hooking it on the cable. **Distance B:** (Make several times larger than the cable diameter) When hooking and unhooking the cable needs to slip through this gap. The string running along B gets more leverage if B is larger.

Distance C: (Make large) When the hook is on the cable, the cable goes to the highest point and the hook rotates so that it is straight up and down as shown by the line labeled "Bear Bag Load". By making C large it makes it very hard for the hook to come off the cable by the wind or people swinging the bags back and forth. The bags would have to be swinging in greater than a 160 degree arc for our designed hook to come off. We could not do this even when we tried during testing.

Distance D: (Make small) When the hook is on the cable, the highest bending load on the hook occurs over the portion of the hook marked by D. By making D very small it becomes very hard for the hook to be "opened up" and fail due to a high overload on the eyelet. In our design D is quite small and allows the 3/8" stainless steel hook to easily hold several hundred pounds without bending.

The final key feature of the hook is the hole drilled in the tip. It need not be a drilled hole, it could be a ring welded on the tip, or a smaller diameter rod bent into an eyelet attached to the tip. What is necessary is to have a hole that the string can pass easily through and be tied to the main hook eyelet. I had trouble on early prototypes with the string getting frayed as it moved back and forth over the sharp edges of the drilled hole. I eliminated this by rounding and sanding the edges of the hole smooth on the final hook design.

Figure 2 shows a photo of the hook I made based on the key dimensions shown in figure 1 and described on the previous page. I don't know if it is an optimal shape based on the four dimensions, but it does work pretty well. For those who want to build a copy of this hook, the grid paper the hook is sitting on is 1 cm grid paper so you can read off all the dimensions. For example, the hook is 5.0cm wide and 8.3cm high. It is not necessary for the dimensions of your copy to be exact. The hook will still work fine even if the copy's dimensions differ from the photo by 0.5cm.

Figure 2. Photo of hook on 1cm grid paper

Besides the shape of the hook, the way the lift string runs through the tip and ties to eyelet is critical to making the hook easy to unhook from the cable. Pulling on the string pulls the cable out of the unloaded hook. The string does not have enough leverage to pull the cable out of a loaded hook. A second idea I learned the hard way is to put a bit of glue on the knot tying the string to the eyelet, because if the string ever comes untied, the hook is stuck on the cable 20 feet high. At that point you have to lift a crew member to the cable to get the hook and retie the string.