



Tender Descender

Congratulations on your purchase of the Tender Descender!

- The Tender Descender is a Main parachute release device for doing dual deployment from a single compartment!
- No longer do you have to modify your favorite rocket with separate parachute bays to do dual deployment!
- Use the Tender Descender in conjunction with an altimeter, drogue & main chute(s) and a main chute deployment bag(s).
- You can use the Tender Descender with any rocket that uses an altimeter for parachute deployment, to do dual deployment from a single compartment without having to do any structural changes to your rocket and you can do it in the field in a very short time!
- Use the Tender Descender to delay the deployment of 1, 2 or even 3 or more main parachutes!
- It's simple! It's reliable and it's affordable!

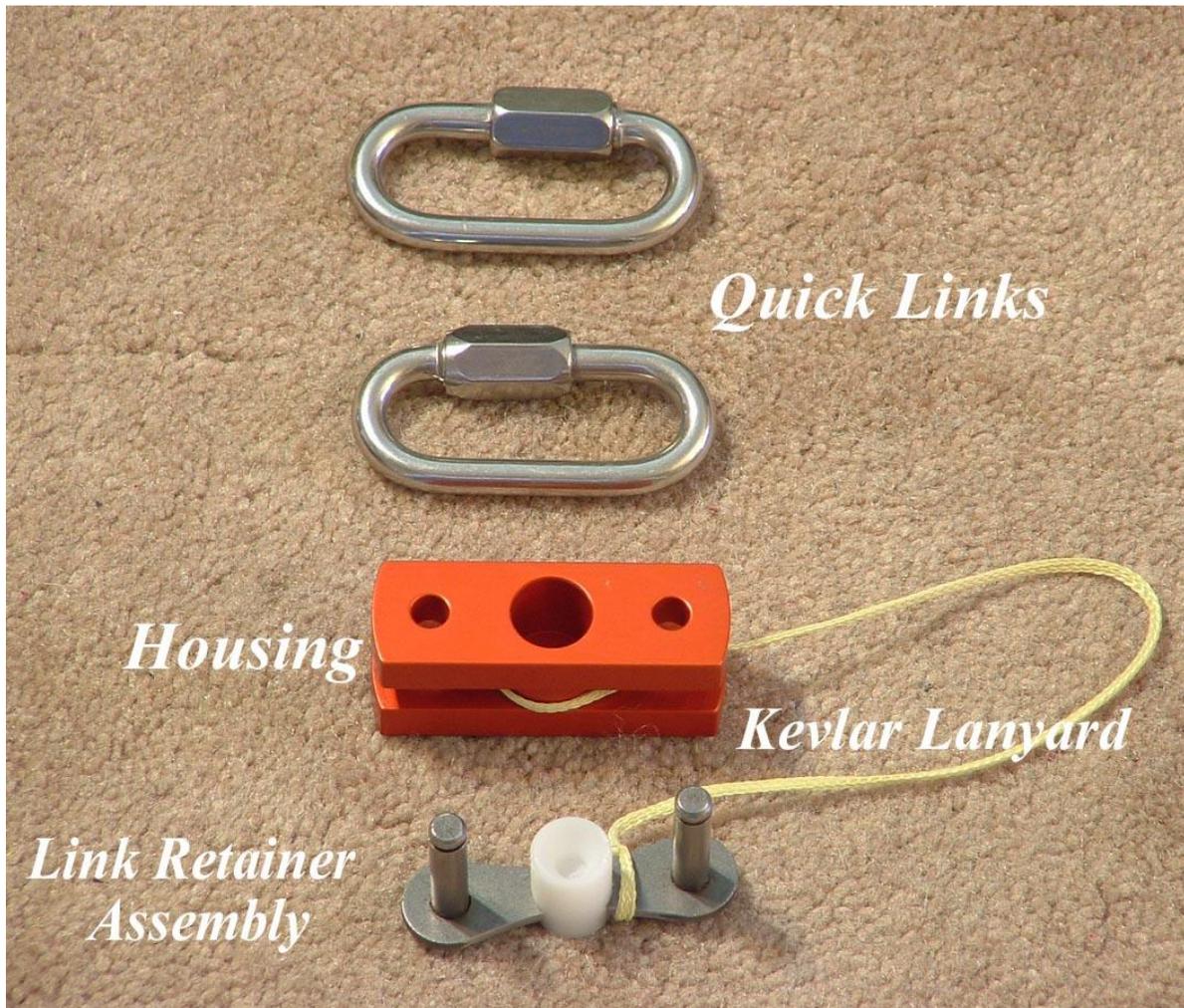
The Tender Descender works by simply keeping the main(s) from deploying by “tying” the drogue to the airframe, thereby preventing the drogue from pulling the deployment bags off of the main parachute(s). Once the altimeter fires the “main” separation charge in the Tender Descender, the drogue is released from the rocket allowing the drogue and the rocket to fall away from each other. Once the parachute shroud lines and risers are fully extended, the lines come taught and the deployment bags are yanked off the main chute(s) allowing for picture perfect deployment of the main parachute(s)!

Made in the USA

By:

Tinder Rocketry
PO Box 335
Clarkston, WA 99403
sealtee@cableone.net

TRAVELING AT THE SPEED OF THOUGHT...



Parts List:

- a) HDPE or Copper toned Anodized Aluminum housing
- b) Link Retainer Assembly
- c) Quick Links 2-each
- d) Kevlar lanyard

Replacement Parts:

Parts are available from Tinder Rocketry in the event that parts are lost.

Warranty:

Tinder Rocketry offers a lifetime limited warranty on the Tender Descender. This warranty is simple; you break it we replace it. You will need to send us the entire Tender Descender postage paid and we will send another one back to you. This warranty is limited to the device itself and does not cover lost parts. No other warranty of any kind is expressed or implied including damage or injury caused by the Tender Descender to life, limb or property!



Specifications

HDPE

Dimensions: **1 $\frac{3}{4}$ " L x $\frac{3}{4}$ " W x $\frac{3}{4}$ " T (W/O quick links)**
 Weight: **39 grams (including quick links)**
 Housing Material: **HDPE – High Density Polyethylene**
 Quick link Material: **1/8th inch Zinc Coated Steel**
 Maximum shock load: **600 lbs**
 Maximum release weight: **200lbs**
 Recommended max rocket weight: **Up to 25 lbs**

L2

Dimensions: **1 $\frac{3}{4}$ " L x $\frac{3}{4}$ " W x $\frac{3}{4}$ " T (W/O quick links)**
 Weight: **52 grams (including quick links)**
 Housing Material: **Heat treated anodized aluminum**
 Quick link Material: **1/8th inch Stainless Steel**
 Maximum shock load: **2,000 lbs**
 Maximum release weight: **500lbs**
 Recommended max rocket weight: **Up to 75 lbs**

L3

Dimensions: **2 $\frac{1}{4}$ " L x $\frac{3}{4}$ " W x 1" T (W/O quick links)**
 Weight: **5 oz (including quick links)**
 Housing Material: **Heat treated anodized aluminum**
 Quick link Material: **1/4th inch Stainless Steel**
 Maximum shock load: **6,000 lbs**
 Maximum release weight: **Over 1,000lbs**
 Recommended max rocket weight: **Over 300 lbs**

Directions:

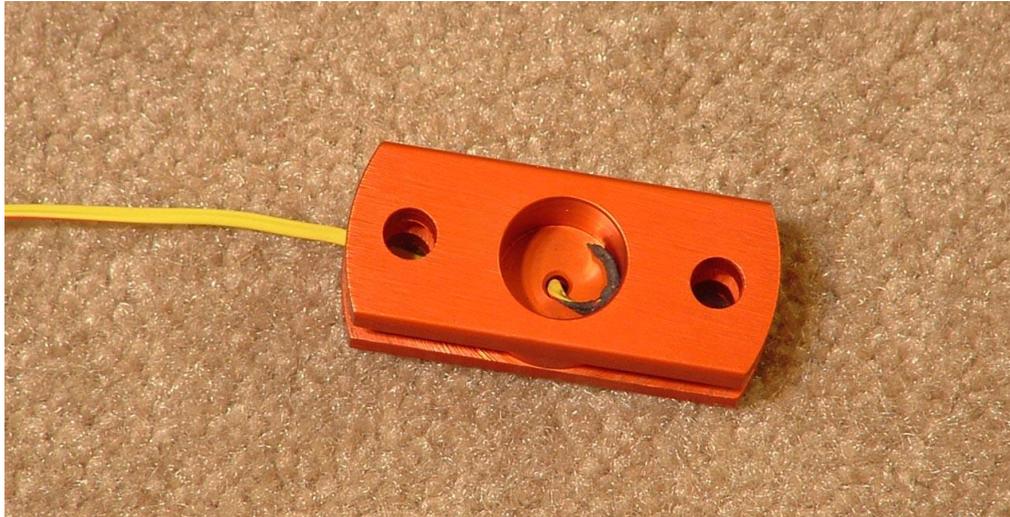
Your Tender Descender comes completely assembled, but will have to be taken apart to load with a deployment charge and igniter. Do so by removing the link retainer assembly from the aluminum housing and lay everything out as shown below.



Install the e-match of your choice. *Important Note: Use whatever e-match that you would like. Always test to be certain that your altimeter will fire the e-match that you have chosen! This is because there are some great altimeters out there of the capacitive discharge type that are designed to fire only very low current devices!*



The Tender Descender shown with various igniters



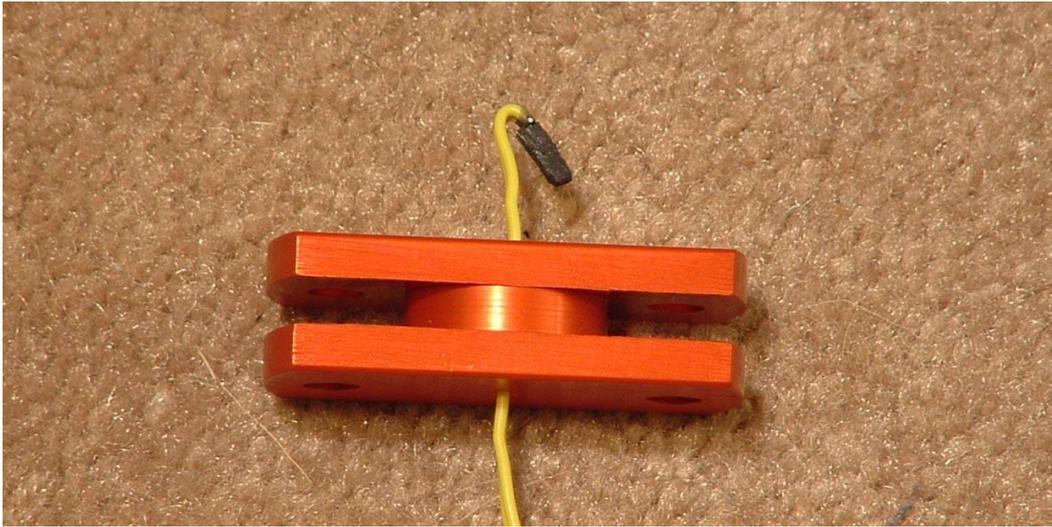
Single Rocketflite MF igniter
http://www.rocketflite.com/products_mf.htm



Double Rocketflite MF igniters for redundancy



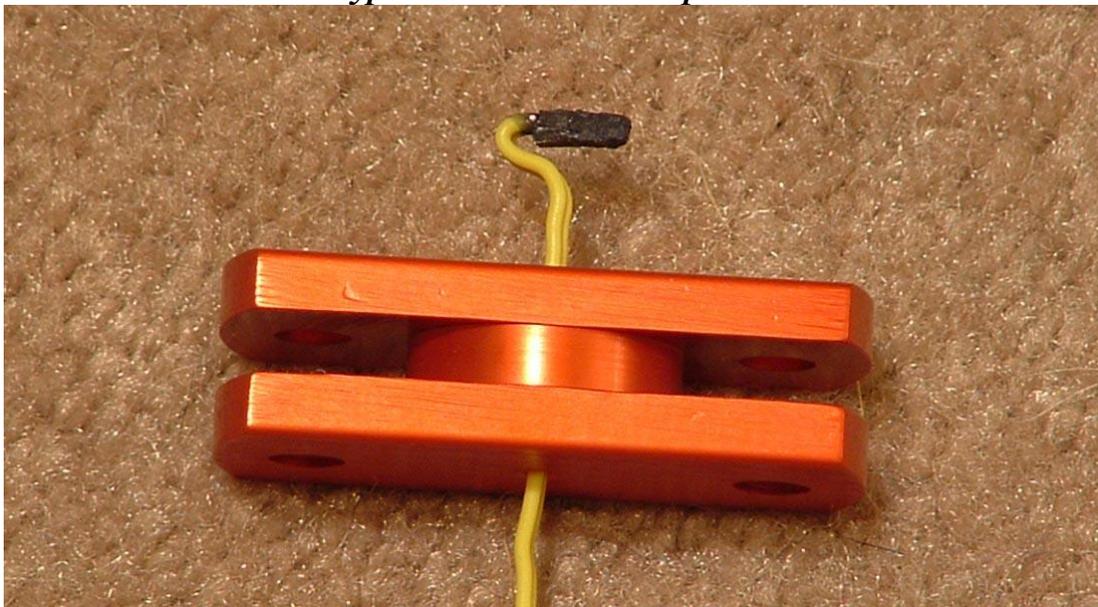
PCB based igniter
http://www.newtons3drocketry.com/shop/product_info.php?cPath=25&products_id=35



"J-tek" type electric match chip – Method 1
<http://www.firefox-fx.com/> & <http://www.skylighter.com/>



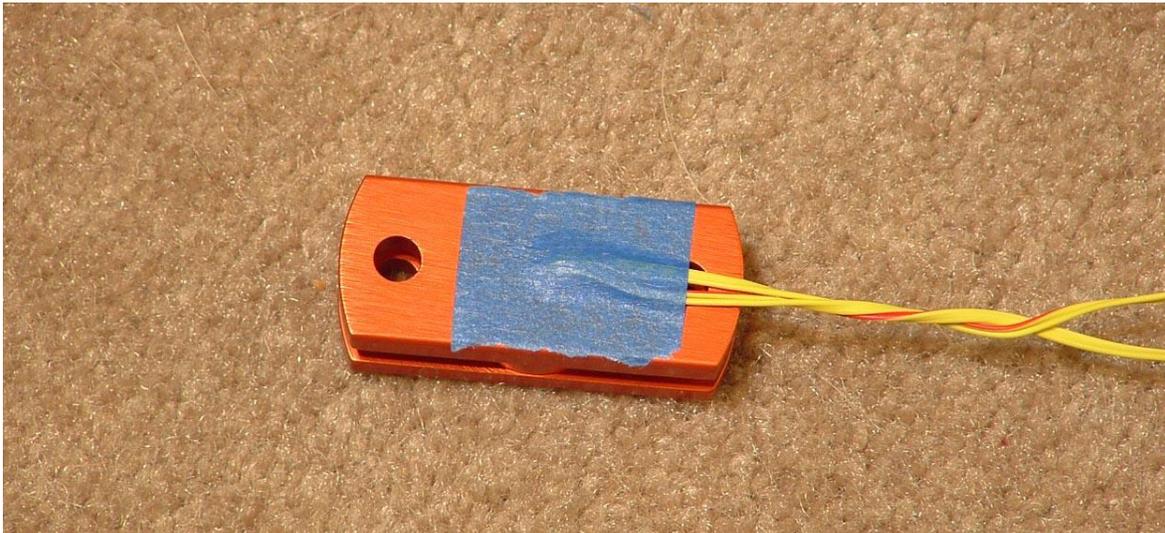
"J-tek" type electric match chip – Method 1



"J-tek" type electric match chip – Method 2



"J-tek" type electric match chip – Method 2



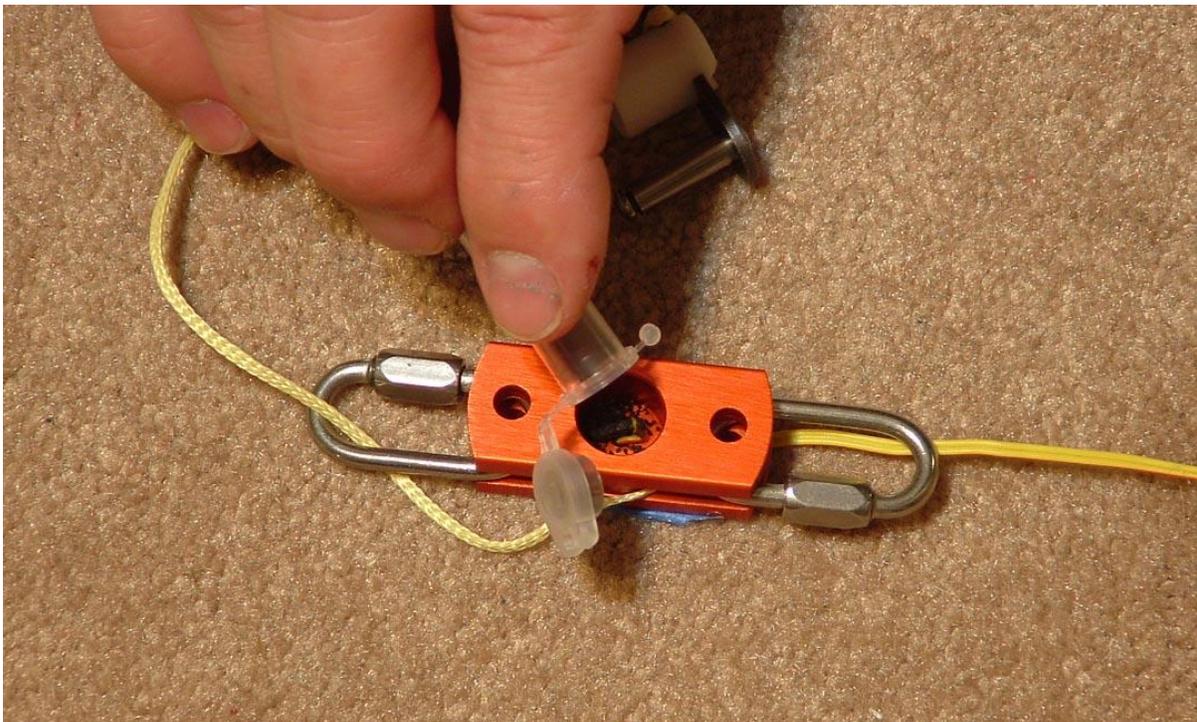
No matter what e-match you decide to use-ALWAYS test it with your altimeter! Be sure to TAPE THE BOTTOM so that the powder charge does not spill out and get ignited by the drogue charge! If this happens, it could make for a VERY LONG WALK! This advice by the way, is not conjecture, it has happened!

Add separation charge. *Note: We recommend using a charge of about 3 grains (.2 grams) of 3F black powder in the HDPE & L2 Tender Descenders and 4 to 5 grains (1/4th – 1/3rd Grams) for the L3. 4F powder works as well. Just be aware that 4F has a bit more energy for any given volume and is a little harder to keep from leaking out the bottom. Weighing the charge with a powder scale is best, but how many of us bring our powder scales to the launch? Hmmm, ok then, how about using one of these familiar “powder measuring devices”...*

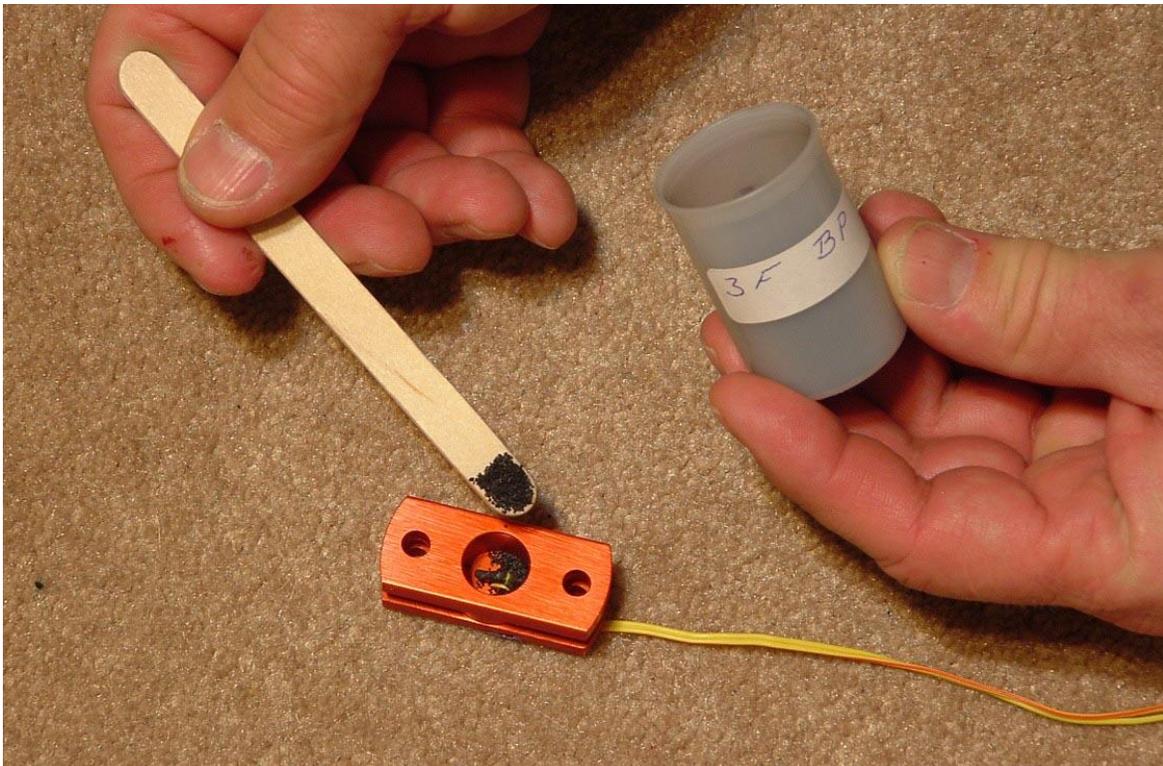
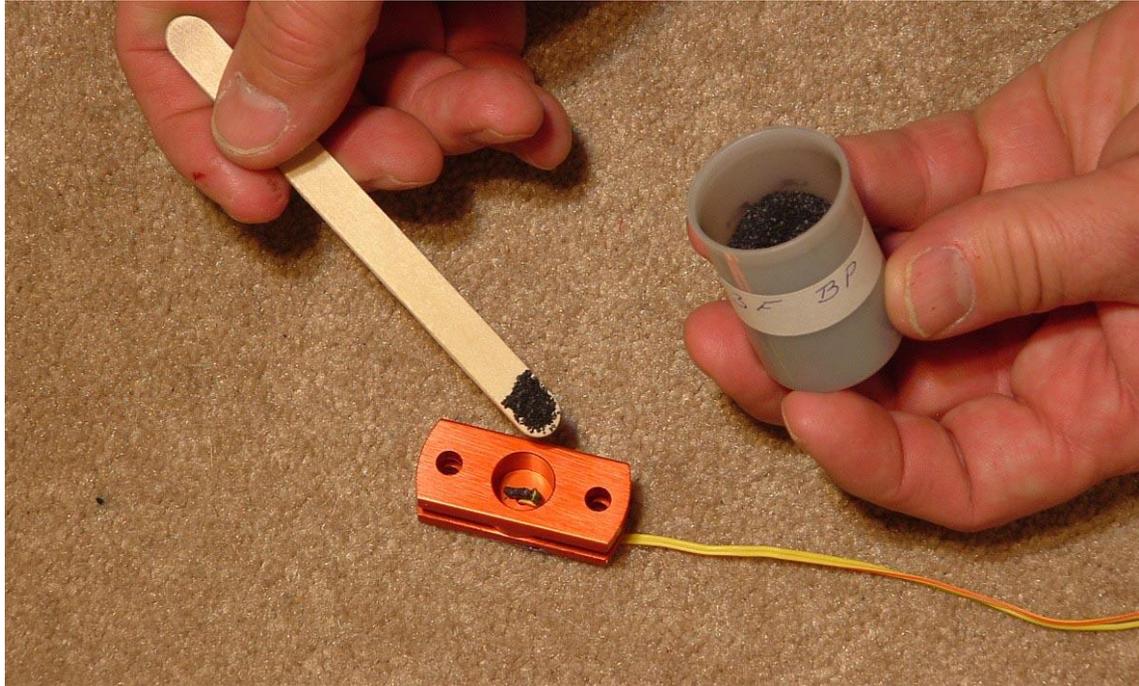
“Powder Measuring Device” example 1



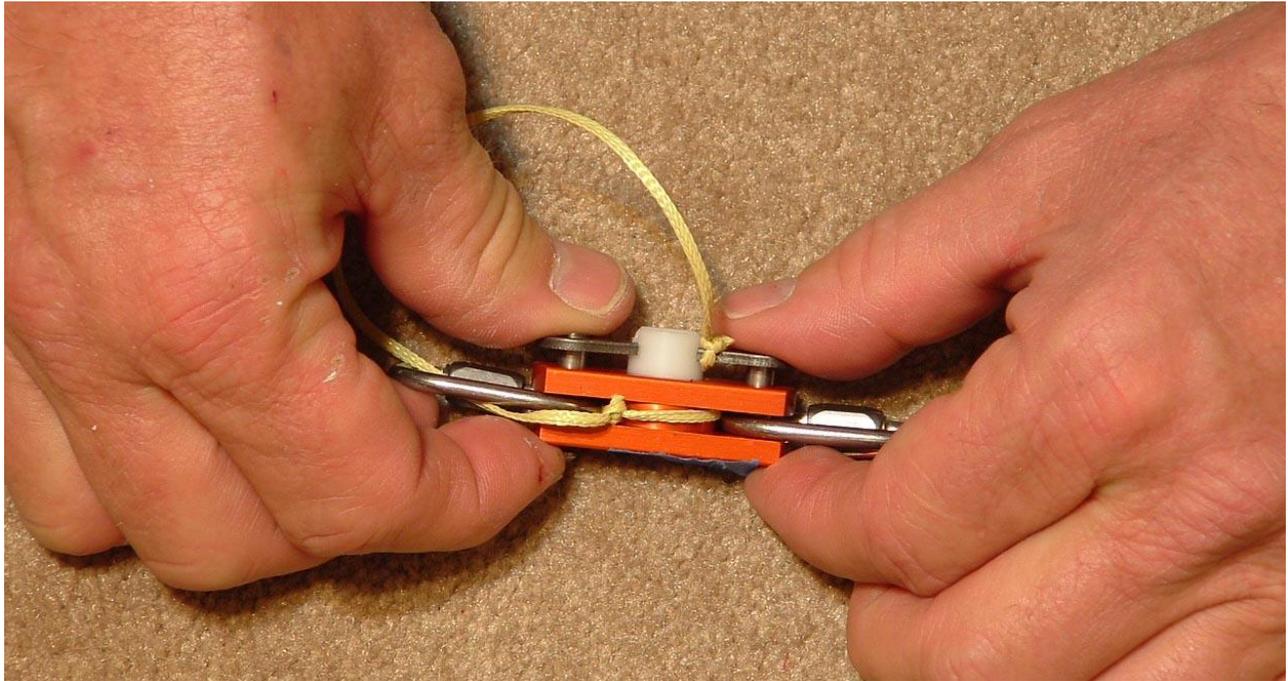
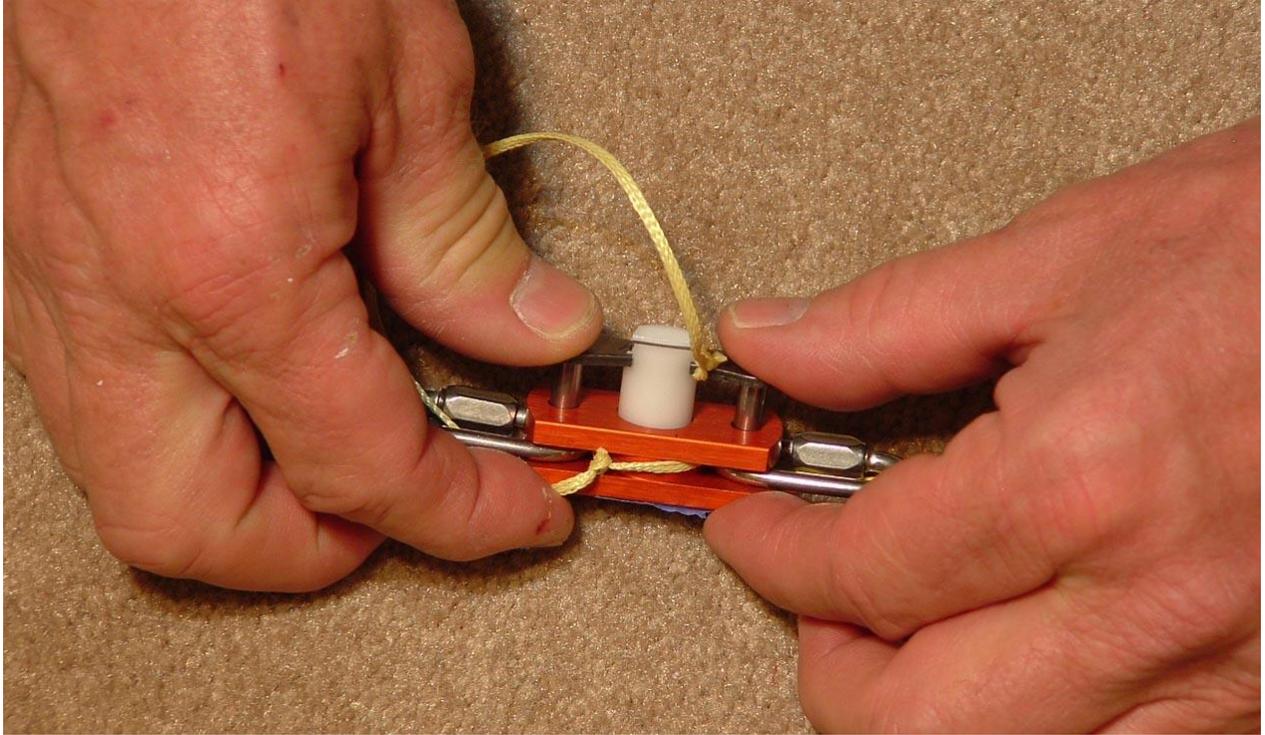
“Powder Measuring Device” example 1



While the above mentioned “Powder Measuring Device” does work, what I do when I am in the field is shown below. I use two “scoops” with my “popsicle stick powder measuring device”. Weighing this “charge” has showed it to be between 3 and 4 grains every time I try it! (Your mileage may vary.)



Install the Quick links and re-install the retainer assembly.



Your Tender Descender is ready to fly!

There are 4 ways that I currently recommend using the Tender Descender and I am working on a 5th,

They are:

- 1) **Connecting it to an existing Kevlar shock cord.**
- 2) **Connecting inside the airframe to an existing eyebolt.**
- 3) **Replacing the eyebolt with a longer one that partially or entirely sticks up outside of the airframe and connecting the Tender Descender there.**
- 4) **Using the Tender Descender to wrap a deployment bag for a “Drogue-less” recovery.**

1) Connecting it to an existing Kevlar shock cord

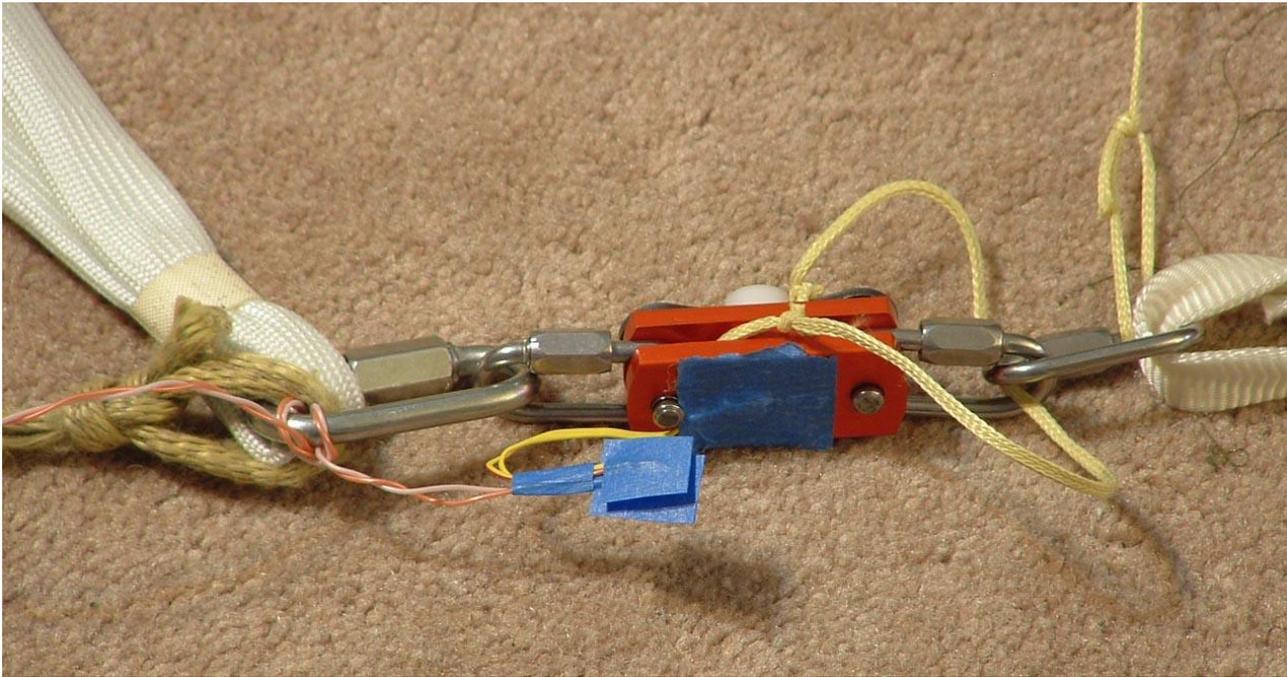
The next 4 pictures show the Tender Descender connected to one chute and a Kevlar shock cord. Note: The Kevlar shock cord should only be long enough to be just outside of the rocket. This will help reduce twisting of the wiring as the rocket falls under drogue. The “real” shock cord is the long one that goes to the nose cone and then the drogue parachute! The bagged parachute should remain inside the airframe until the Tender Descender separates allowing the drogue to pull the bagged main out of the airframe then pull the bag off of the main chute itself allowing it to deploy!

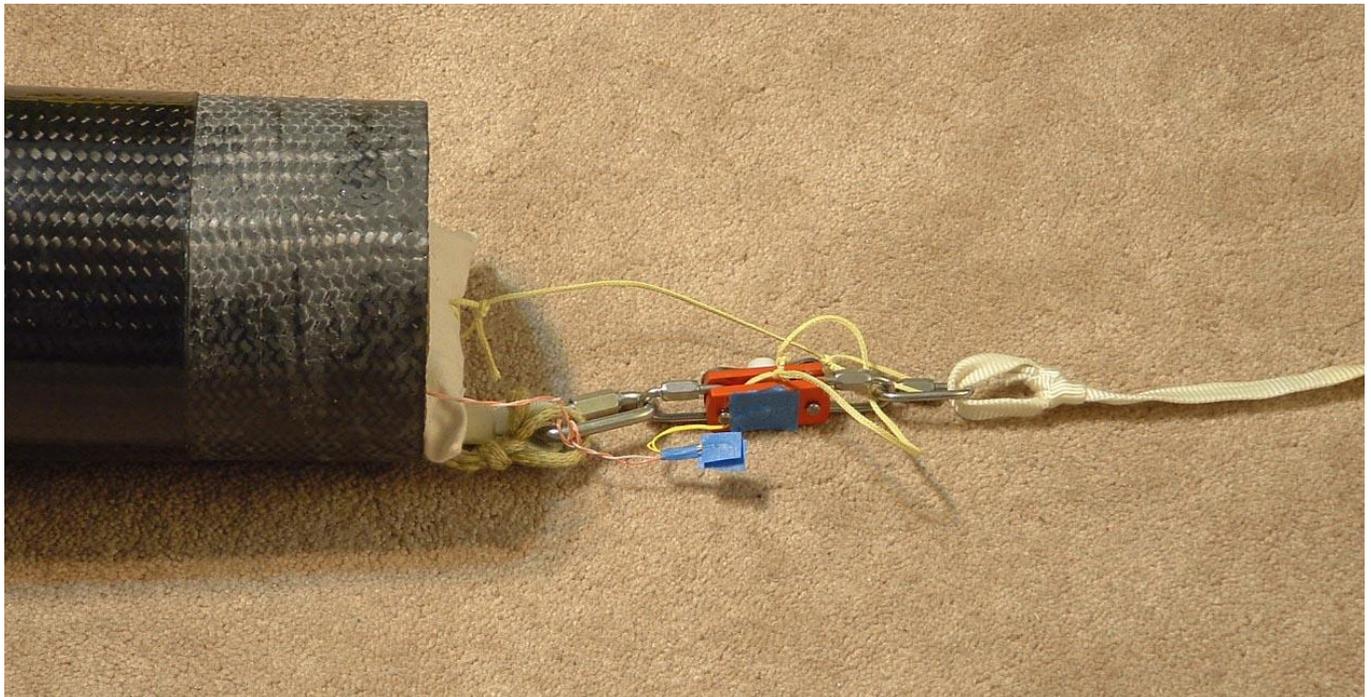
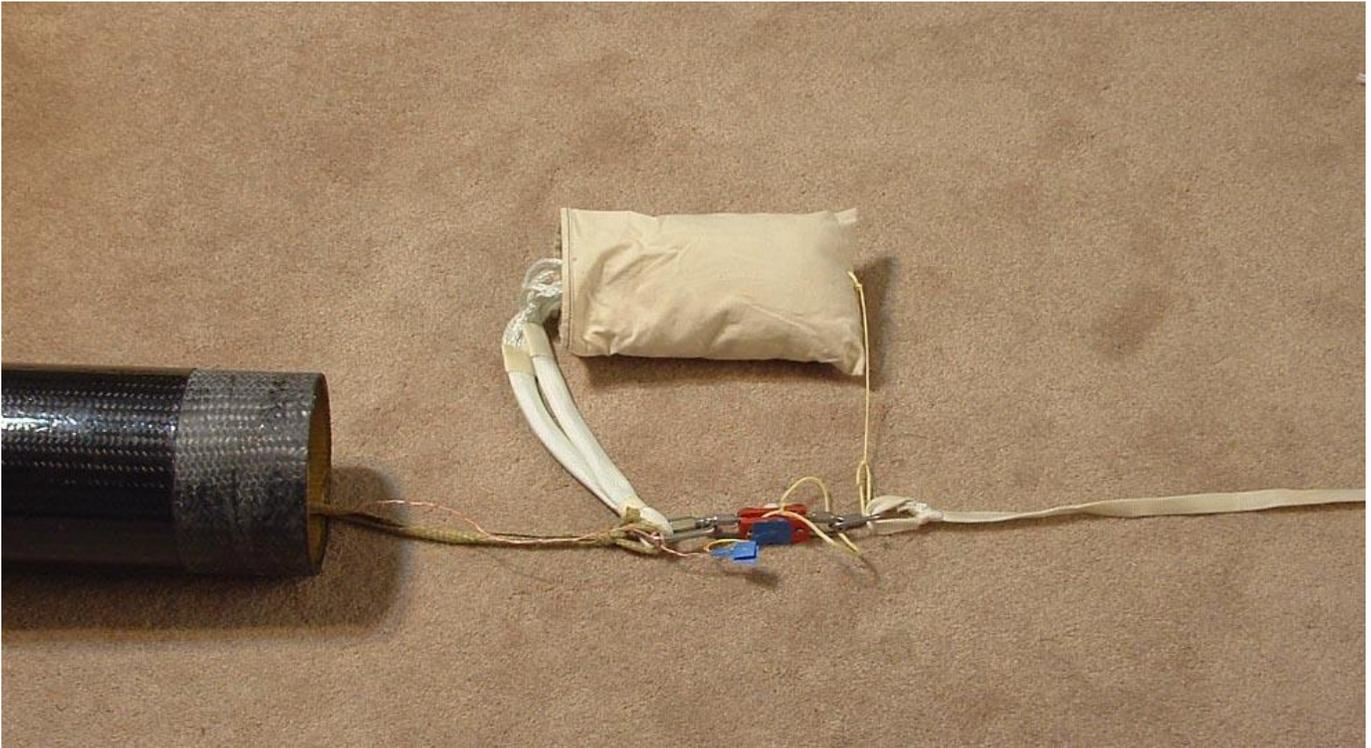
This is in my opinion possibly the most challenging method of using the Tender Descender, but entirely do-able. The reason it is challenging is that even with a shorter cord going to the airframe, the cord and wire to the Tender Descender WILL GET TWISTED! As a result we have to make sure that the wire going to the Tender Descender is secure enough that it will not come apart as a result of this twisting and STILL ALLOW the wires to be pulled apart when the Tender Descender separates and the drogue pulls on the main. In addition, we do not want anything to get tangled or caught that would prevent the drogue from pulling on the main! No problem, right?

Here is one way to do this that is simple and has a VERY high probability of success. First off, plan on using a sheath over your Tender Descender, either one that you make or a nice one that you get from Fruity Chutes for \$7! This is actually something that **I recommend for all flights with the Tender Descender**. Reason being, is that it keeps control of flying parts and it acts as a further shield against the drogue charge accidentally setting off the Tender Descender charge!

(http://fruitychutes.com/buyachute/index.php?main_page=product_info&cPath=9&products_id=52)

Now I am assuming that you have your Tender Descender with you and it is completely assembled with igniter and powder. (You DO, don't you?) Ok, then. Now cut the igniter wire so that you have about 3 inches out the back of the Tender Descender. From the airframe, securely attach a slightly heavier wire, say about 24ga doorbell wire for example, make it about 5 inches longer than the Kevlar cord coming from the airframe and tie it to the quick link as shown in the next 4 pictures. Twist the wire together, about 2 full twists and cover with masking tape and trim. Be sure that the Tender Descender Lanyard is connected through the “top” quick link so that the separated Tender Descender will go “up” with the drogue and deployment bag.



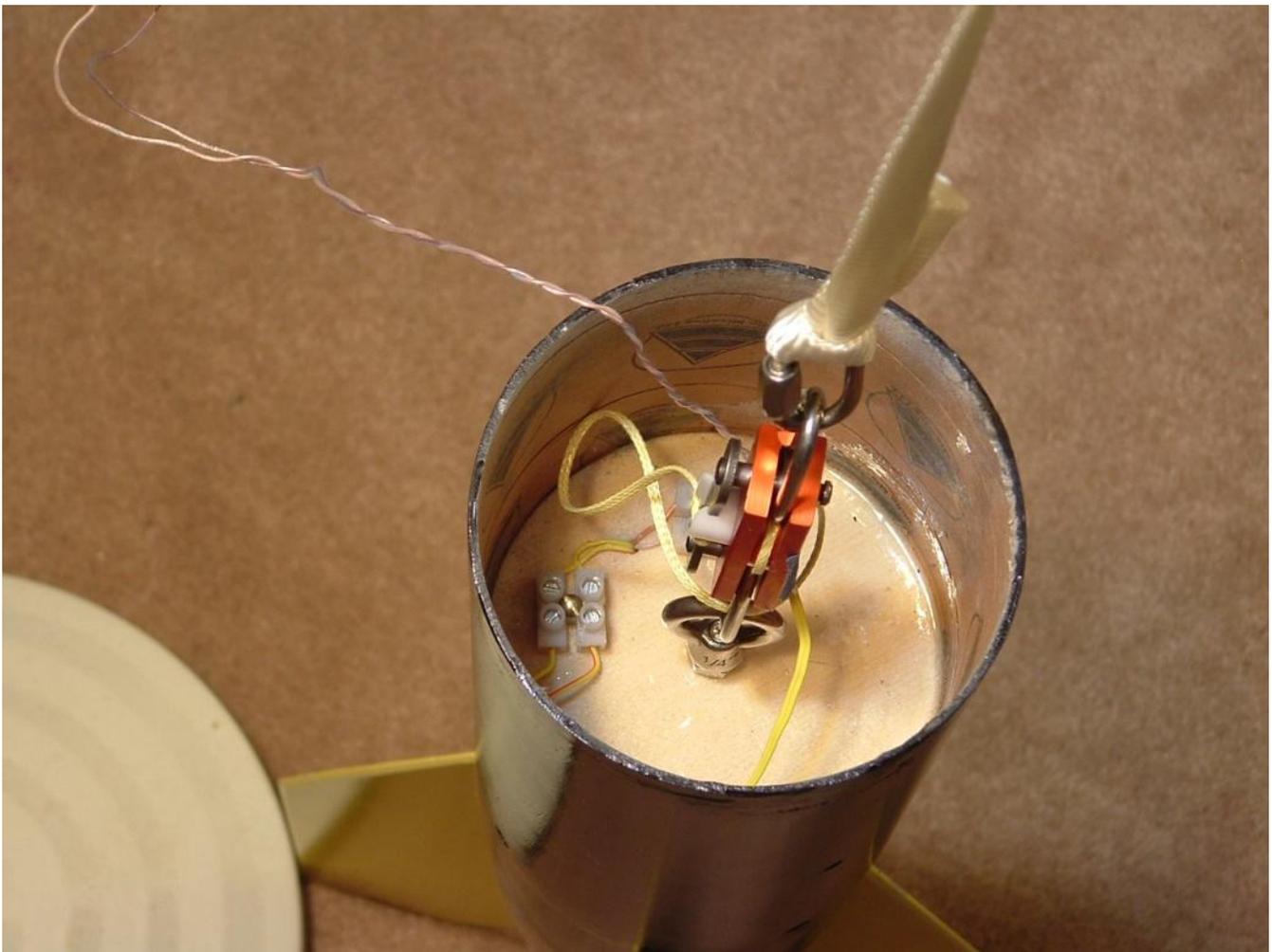


Done this way, the Kevlar cord and the 24ga wire can twist as much as they like without a risk of coming undone with the Tender Descender! When the Tender Descender separates, the wires that are secured by the blue masking tape will easily be pulled apart and the drogue will be able to pull the main without tangling with any other parts!

2) Connecting the Tender Descender inside the airframe to an existing eyebolt.

Ok, so you will have to use your imagination on this one. Please do. This airframe was never designed to fly this way, but it is very open so picture taking is very easy. You will have to imagine that the existing eyebolt is way down inside the airframe, say maybe a foot or more. One thing that is important to note with this configuration is that the Tender Descender lanyard is NOT connected to the forward quick link! This is because with the Tender Descender located inside the airframe and UNDER the main chute, we do not want it to “go up” with the drogue when the main is released. We want the Tender Descender to stay with the airframe on this one! This will help to prevent tangling which might inhibit complete deployment of the main.

This picture shows just the Tender Descender as it is connected to the airframe and the shock cord that goes up to the nosecone and the drogue.



This next picture shows the bagged parachute as it is connected to the same eyebolt in the airframe.



Important! The Kevlar lanyard on the Tender Descender, in this case, is connected “down” to one of the aft quick links. This is done to **KEEP the Tender Descender WITH THE AIRFRAME!** This will make it so only a single quick link needs to slide past the deployment bag to allow the drogue to pull the bag out of the airframe.

The bagged parachute sits on top of the Tender Descender.

This may have to be done by connecting the lanyard to the quick link first, then inserting the chute into the airframe and finish by tying and cinching the lanyard to the top of the deployment bag. This will keep the bagged chute inside the airframe until the Tender Descender releases.



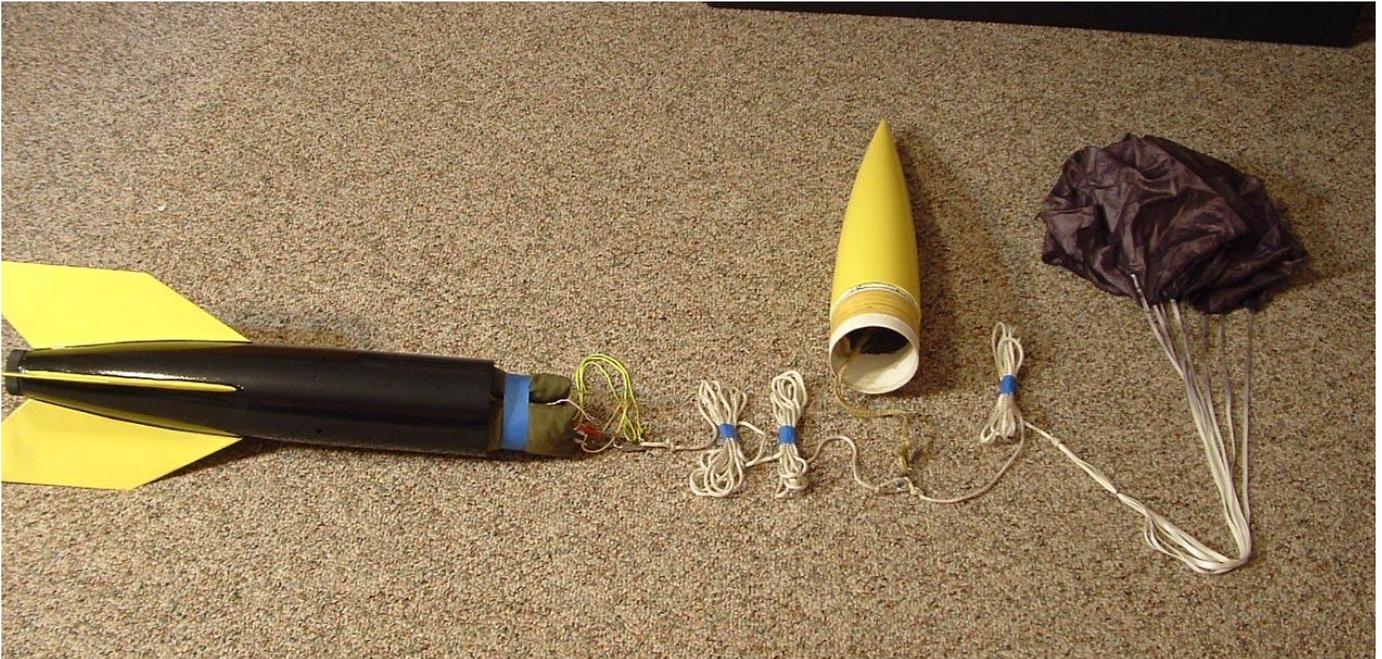
Ok... reality check! *The Tender Descender is going to be connected just as I said, but, we are going to “Bag it” to protect the airframe from the rapidly moving Tender Descender parts! You can either make a bag or sheath yourself out of Nomex material, or a much better Idea is to buy a nice one already made from Fruity Chutes for \$7! (http://fruitychutes.com/buyachute/index.php?main_page=product_info&cPath=9&products_id=52)*

Important note: *This is the preferred method for using the Tender Descender in the larger heavier rockets. When the shock cord itself is secured to the “top” of the deployment bag, as well as the “top” of the Tender Descender, the bag itself acts as sort of a “zipper-less” design feature for the rocket, not really too much different than those “anti-zipper balls” you see that distribute force over a larger area.*



3) Replacing the eyebolt with a longer one that partially or entirely sticks up outside of the airframe and connecting the Tender Descender there.

This method works particularly well with medium sized rockets especially those that use two or more mains! The following pictures are of the Tender Descender completely laid out with the recovery system for a 4 inch somewhat shortened V2. I fly this rocket with an extended eyebolt and space the three bagged, 4 foot mains around that eyebolt. I use this EXACT same method for my 18-1/2 pound Jayhawk, just with larger components. (Note: The double layered Nomex blanket is not shown for clarity.)



In the above picture, **imagine the drogue is fully inflated and the lines are NOT bundled, this then is the rocket falling under drogue.**





Each deployment Bag is connected to one of the forward quick links.

The Tender Descender lanyard is also connected to the forward quick link. This is so that after the Tender Descender releases, the Tender Descender along with the bagged chutes go “up” with the drogue. The only thing that gets left behind is the “bottom” quick link. This virtually eliminates the possibility of entanglement.



You can see that the three mains are connected to the quick link that is connected to the eyebolt. This quick link to eyebolt connection does not allow any twisting!

(Please note: Shown in these pictures is the Tender Descender L2. I actually fly this 4 inch, 5-1/2 pound V2 with the **HDPE** Tender Descender, however, the beautifully anodized aluminum L2 Tender Descender just simply looks nicer in pictures!)

Deployment sequence- 3chute main shown – Single chute deployment is similar...



Under Drogue... (OK, the lines are not supposed to still be bundled!)



Tender Descender “pops” and releases... (Blue tape on bags is removed for clarity)



Drogue begins to pull on mains...



Mains are pulled from the Airframe...



Risers begin to deploy...



Risers are fully extended and the chutes are beginning to get pulled...



Chutes are half out of their bags...



Chutes are out and can deploy with virtually no chance of entanglement! (Note: The Tender Descender goes “up” with the bags and the drogue!

4) Using the Tender Descender to wrap a deployment bag for a “Drogue-less” recovery.

First off, I hope that it is **obvious** to you that the Kevlar “shock” cord shown in the picture below, is shown very short for clarity! ☺ The parachute (in this case a 5 foot parachute) is tightly wrapped in a Nomex blanket and cinched together with the HDPE Tender Descender and a short piece of nylon cord. When the Tender Descender is separated, the Nomex blanket is freed allowing the chute to escape and deploy. The short nylon cord is connected to the airframe so the Tender Descender does not free fall and become lost!







4 inch V2 under chute

Final thoughts... Much effort has gone into this manual to be as clear and complete as possible. I primarily showed one rocket, a small one at that, for all of these recovery techniques. The reason is simple; it's small and easy to photograph inside the house! But here's the deal, if you think that you can do better in showing pictorially how the Tender Descender can be used, PLEASE DO! Show me how you use the Tender Descender in your favorite rocket and do so with few words and up to 3 pictures. I may include them in this online manual on my website! ☺

Fly straight, fly high and return your rocket in style with your Tender Descender!

Thank you and God Bless You!