

Peregrine UAV Quick Start Guide

This Quick Start guide summarizes the instructions and resources needed to get you going with the Peregrine UAV Recovery Systems and to help you be successful. The guide includes URL's where you can download additional resources for using specific components of the PUAV System.

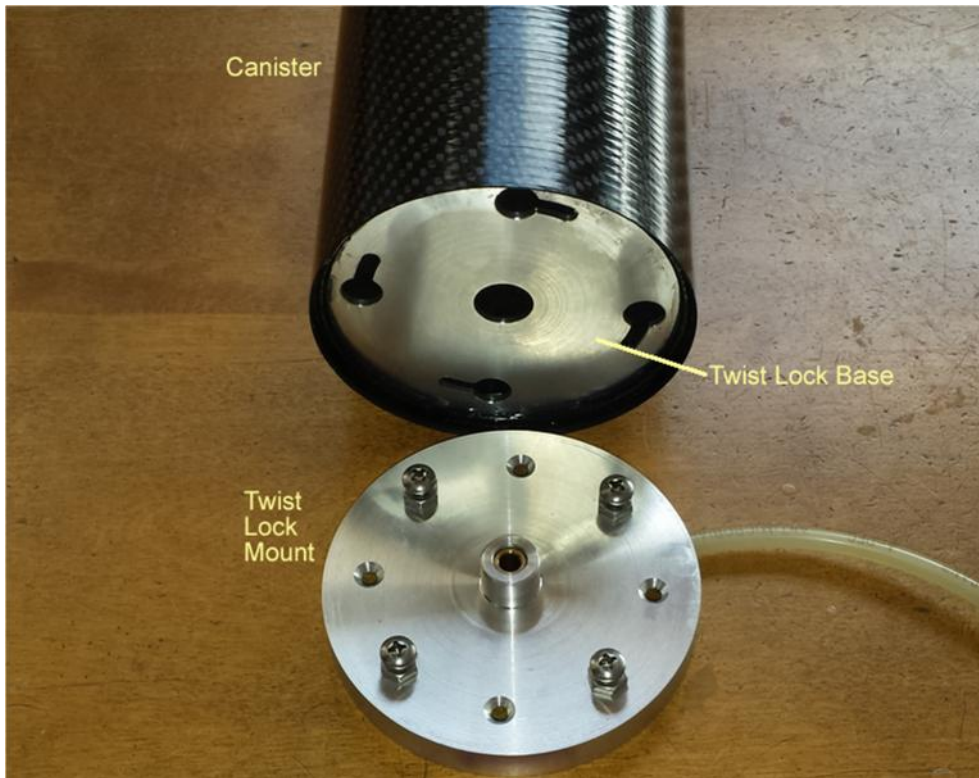
PUAV Components Overview – The PUAV encompasses two types of materials, sewn goods, and hardware goods. The hardware includes the PAUV canister, base, and CO2 Release. We have two CO2 releases, the Hawk CO2 Release, and the Raptor CO2 Release. The PUAV Canister and base are the same for both versions of the PUAV hardware.



The Peregrine UAV Hardware Kit with the Raptor CO2 Release

UPAV Hardware Guide

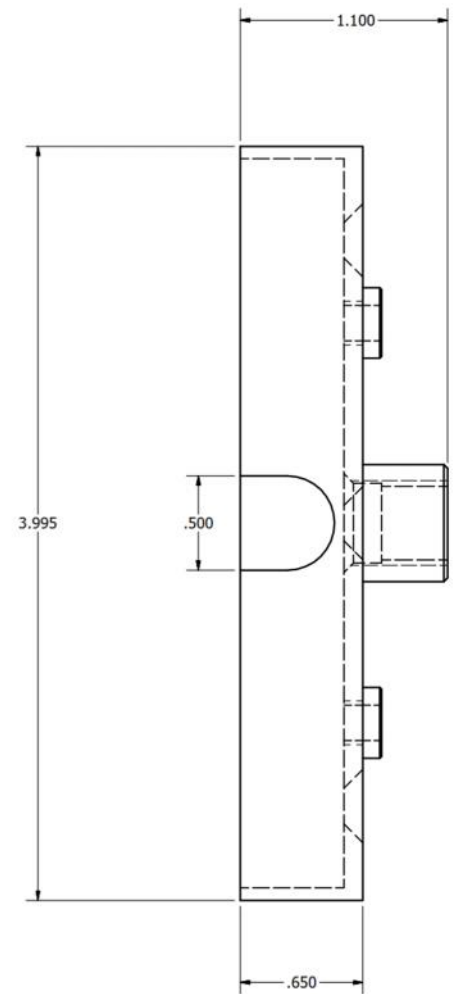
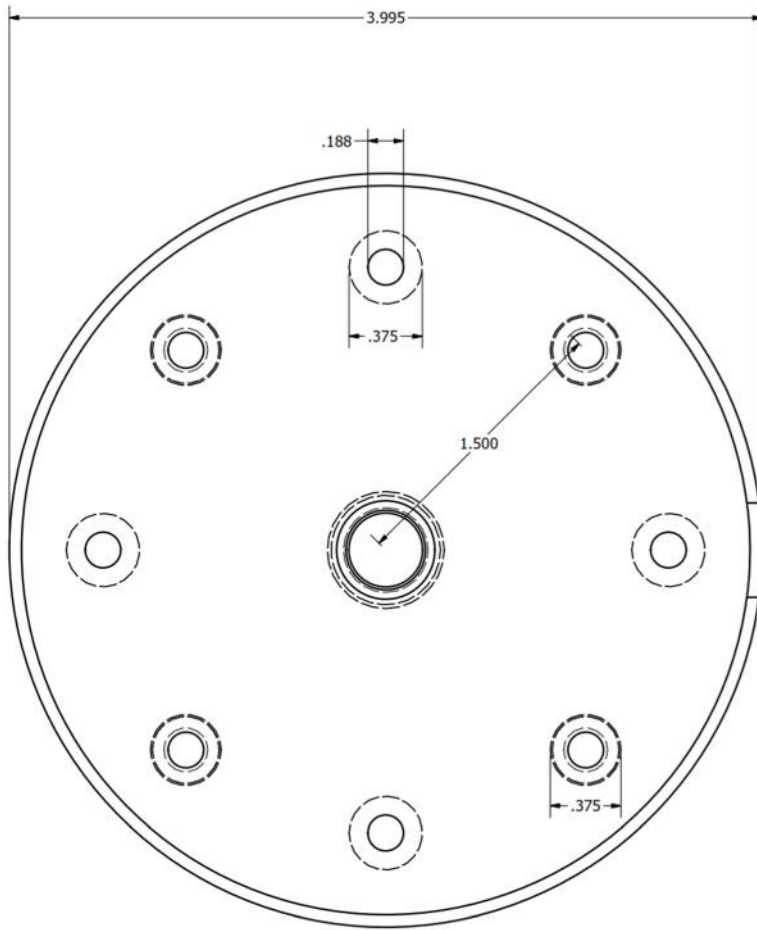
PUAV Canister and twist lock base – All PUAV systems come with a carbon fiber canister sized for the parachute. Canister diameters are 4", 5" and 6"D with the length varying depending on the parachute size. All canisters are sized to achieve a parachute packing density of approximately 0.22 – 0.28 oz / cu" density. The canisters have a machined aluminum cap and key hole base plate. The cap is held in place with from 4 to 8 nylon screws or arrow pins depending on the size. All canisters twist lock onto a 4"D machined aluminum base.



The Canister and Base

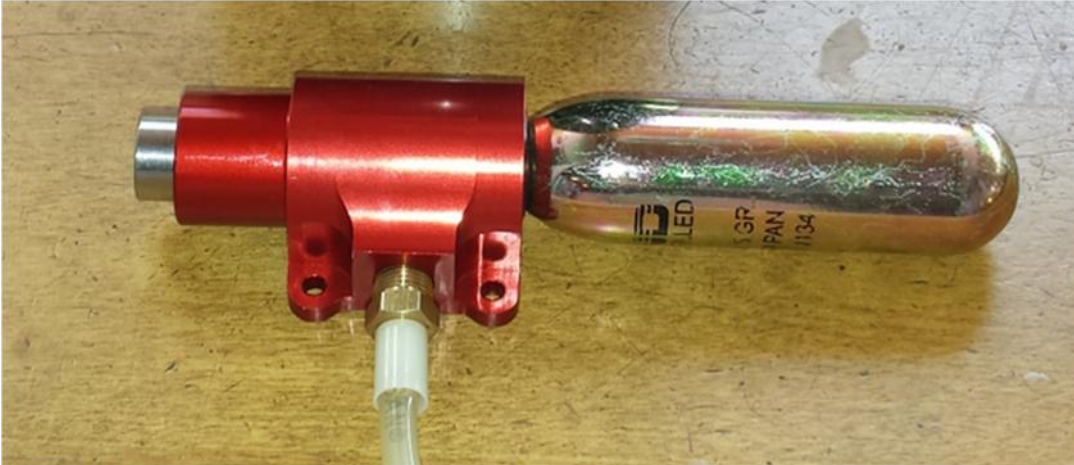
4" Mounting Base – All systems use the same 4"D mounting base. The base is mounted to the UAV with four counter sunk machine screws. The canister is locked into place by centering the canister onto the base and rotating until the key holes drop over the mounting screws. Then push down and twist clockwise in order to secure the canister. If the UAV is subject to vibration you should provide secondary securing of the canister in order to keep the canister from rotating loose.

IMPORTANT: Be sure to always use four screws to mount the twist lock base so there is gas leakage from under the base plate!

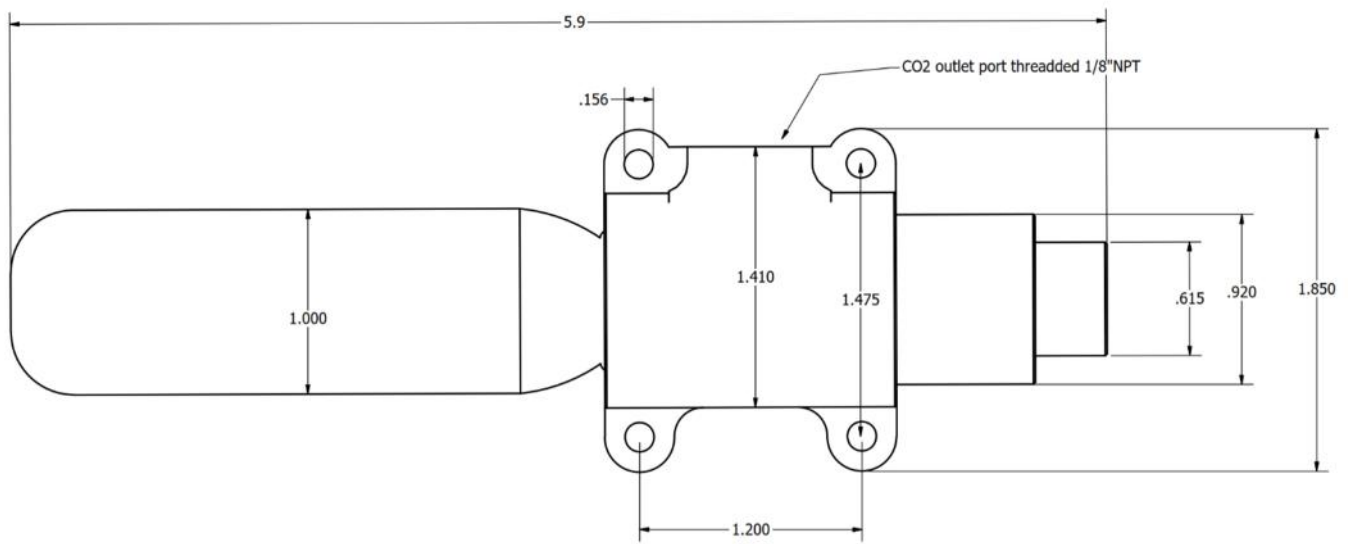


Pressure Hose – The PUAV base plate comes standard with ¼" ID hose that can withstand up to 600 PSI of pressure. We do not recommend using a lower pressure hose. If the CO2 cartridge is at a high ambient temperature then the internal cartridge pressure is very high and the hose can possibly burst.

Raptor CO2 Release – This release uses a small Pyro charge in order to fire a piston into the CO2 Canister in order to puncture the CO2 cartridge.



Raptor CO2 Release



Raptor CO2 Release Mechanical Outline

The following documents cover the use of the Raptor CO2 Release:

Loading the Raptor Pyro Charge - http://fruitychutes.com/docs/Peregrine_Raptor_Manual.pdf -

Note - This guide is for the Raptor CO2 release for Rocketry, but the loading and charge cup directions are exactly the same for the Raptor UAV release.

This outlines the Raptor Best Practices and where to purchase the consumables:

<http://fruitychutes.com/files/Raptor%20CO2%20Release%20Best%20Practices%20and%20Replacement%20Parts.pdf>

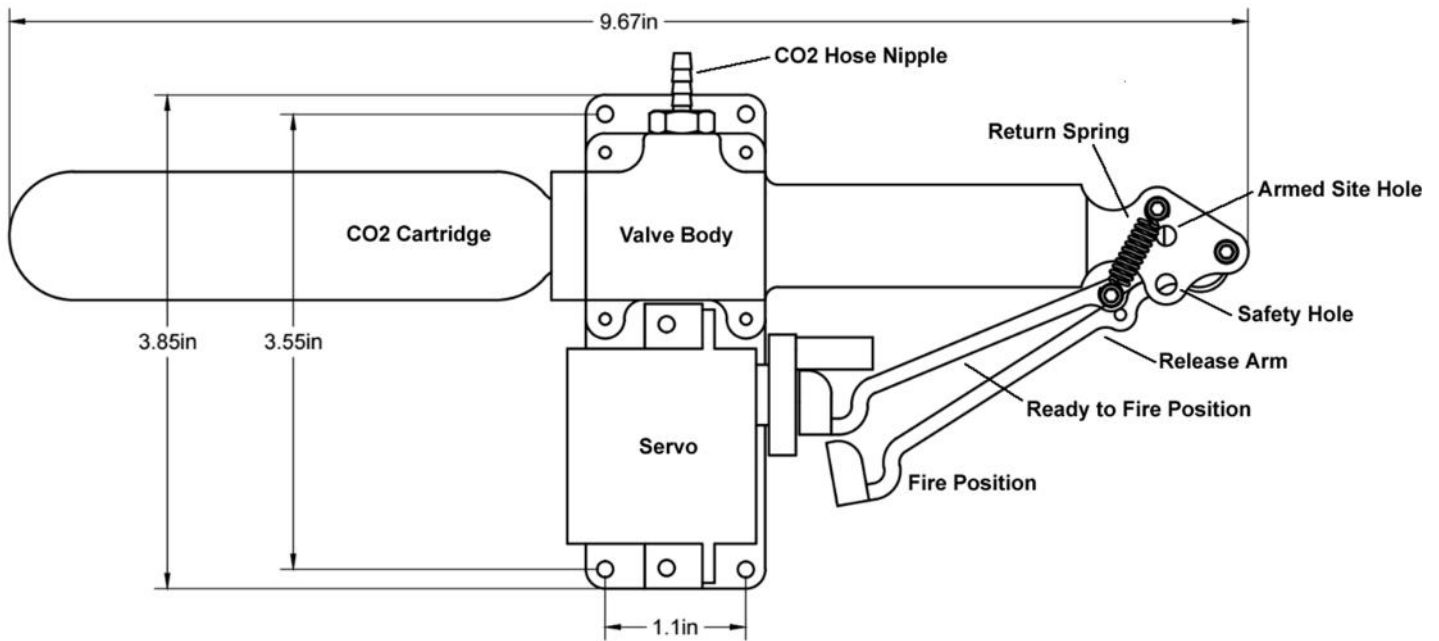
Hawk CO2 Release – The Hawk is an entirely mechanical release and does not need any pyro consumables in order to operate.



Hawk CO2 Release



PUAV with the Hawk Valve



Hawk Mechanical Drawing

You can download the Hawk Users Guide Here:

<http://fruitychutes.com/files/hawk/Fruity%20Chutes%20Hawk%20CO2%20Release%20Valve%20instructions.pdf>

Recommended CO2 Cartridges - The Hawk Release uses industry standard 3/8" or 1/2" threaded CO2 cartridges. These are widely available from various sources. A commonly available 23 or 24 gram 1/2" threaded cartridge used to inflate life vests and other safety gear will work well for most parachute ejections. For smaller chutes (under 120") a 16 gram 3/8" threaded cartridge will work well. For the largest chutes use a 33 gram 1/2" threaded cartridge. In the US CO2 cartridges can be ordered from Fruity Chutes. You can also purchase cartridges from Leland Limited Incorporated (http://www.lelandgas.com/small_high_pressure2.1.htm). Order these part numbers:

CO2 Bottle - 23gr 1/2 Thread - 84203Z

CO2 Bottle - 24gr 1/2 Thread - 84204Z (used in life vests)

CO2 Bottle - 33gr 1/2 Thread - 85202Z

CO2 Bottle - 16gr 3/8 Thread – 81121

Most any generic 3/8" CO2 cartridges will work. Do a static test beforehand of the parachute system to verify the CO2 cartridge size.

NOTE: The Raptor CO2 stock valve is setup for only 1/2" CO2 cartridges. You can optionally get the raptor valve body setup for 3/8" cartridges.

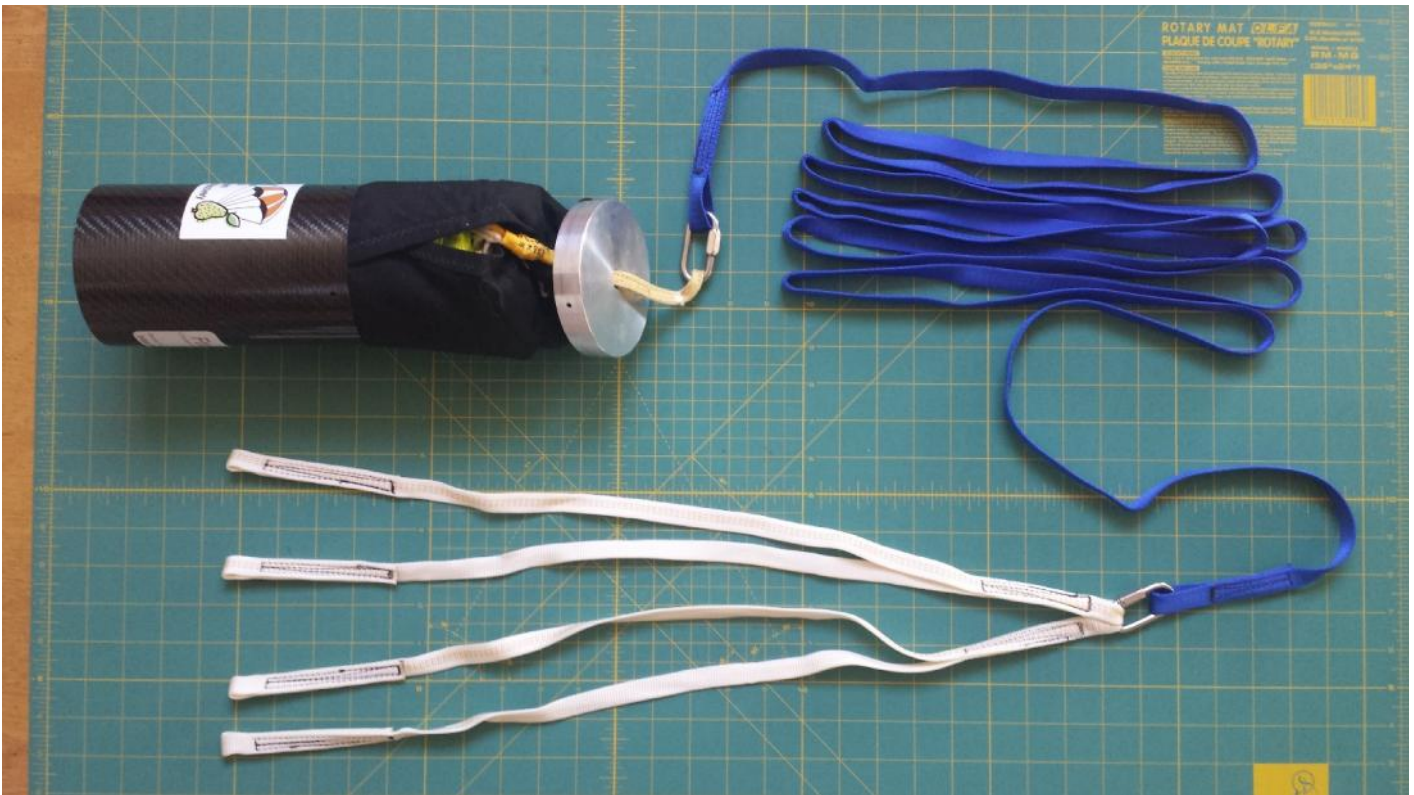
Mounting – There is not a single "correct" way to mount the PUAV hardware, it varies widely with the type of UAV and configuration. The canister and valves can be mounted at any orientation. The canister opening should be pointing out and away from the UAV.

Parachute, Shock Cords, Harnesses and Connectors

The rest of the PUAV system consists of sewn goods as well as connection hardware. Below lists the goods provided:

- Main Parachute – Iris Ultra Compact Chute
- Main Shock Cord – Nylon Webbing
- Harness Assembly – This can be two 2 Y harnesses, or 4 straight harnesses. Materials can be Nylon or Kevlar
- Large quick links (2) – These connect the main parachute to the shock cord. And then from the main shock cord to the harness assembly.
- Smaller quick links (4) – These are usually one size smaller than the main quick links and connect each end of the harness assembly to one of four hard points on the UAV.
- Chute Liner – The parachute is packed in a cloth liner to avoid abrading the parachute and damaging it when packing into the canister. The liner also increases the CO2 efficiency and results in the parachute to ejected at higher speeds.

Connecting it all up – The picture below shows the order of connection of the various rigging components. The open ends of the 4 point harness each connect to the UAV hard points. The canister is shown open and the parachute is loaded inside the chute liner for illustration purposes.



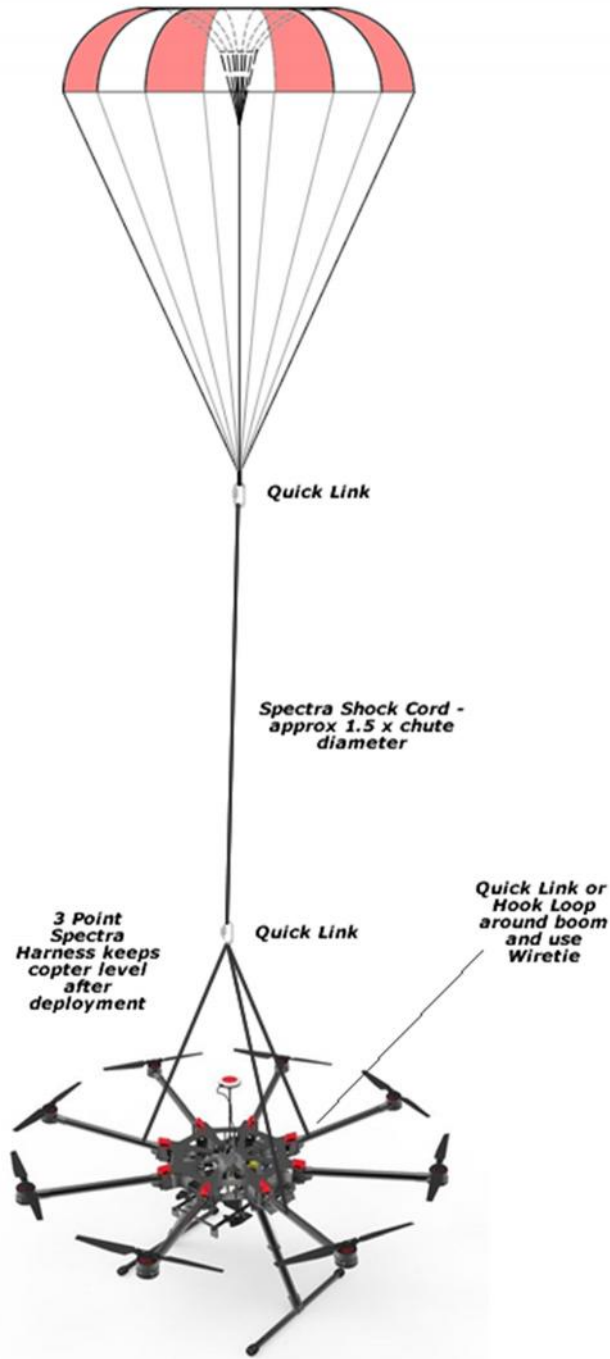
For most systems only the parachute is packed into the canister and the main shock cord is stowed externally. The harness assembly is always external to the canister. Having the parachute separated from the UAV by a shock cord greatly increases the vertical stability while under descent lessening the tendency of the load to swing from side to side.

NOTE: Upon request a custom canister can be made that has a hard point built in. In that case there is no twist lock base. Also if you want to stow the main shock cord in the canister we can size the canister longer to accommodate the extra bulk.

NOTE: We never recommend the direct connection of the parachute to the load!

Connecting the Harness to the UAV – This varies widely with the UAV, and is quite different between copters and fixed wing systems. For multicopters the ends of the harnesses can each be connected to each of the rotor booms. You may need to add an eye-bolt or u-bolt in order to quick link these. You can connect a U-Bolt directly through the booms. Then put the u-bolt through the harness end loop and attach to the rotor. The photo below shows how the Skycat connects to a copter with each harness leg to separate booms.

Single Parachute Rigging for Skycat Bundle



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For fixed wing you can add hard points and u-bolt connections at left / right front, and rear for each of the harnesses. Or two hard points at the CG – left / right.

Rigging Stowage – For most systems the main shock cord is z-folded and masking taped into a nice compact bundle. It can be stowed in some compartment, or it can also be masking taped to the side of the canister in the case of multi-copters.



Example of Z-fold and taping of a 5 yard 3000# Shock cord



Simple way to attach the main shock cord to the canister for Multi Copters where the speed is lower. Upon parachute deployment the tape is broken easily and the cord extends.



Shock Cord Stow Bag (custom product)



Stow Bag opened to show cord z-folded

Connection to the UAV - Having the recovery system mount externally of the canister is by design and because the parachute deployment can generate very high loading on the UAV when opening. External mounting allows an effective multi-point harness to be used to keep the UAV level upon descent.

Folding and packing the chute – The links below will assist you with the proper folding and loading of the canister.

Pictorial on folding the Iris chute using the Rigger

Jig:http://fruitychutes.com/help_for_parachutes/how_to_fold_a_iris_parachute.htm

Packing the Parachute into the Canister -

http://fruitychutes.com/help_for_parachutes/packing_co2_parachute_deployment_system.htm

After loading the chute into the canister be sure to use the sheer pins to retain the cap. The sheer pins actually play a key role in maximizing the deployment height by holding the cap on until sufficient pressure has built up in the canister. When the pins break loose the parachute is ejected at high speed.

Good Practice Tips – Here are some tips to maximize your success.

Ground Test your installation – Before you fly it in the air make sure everything works perfectly on the ground. Test multiple times. For the Raptor and Hawk release make sure you are piercing the CO2 with a hole size that is at least 0.100” diameter or more.

Have a plan if something goes wrong – Make sure you know what to do if you have a failure.

Fly with a safety copilot – If you are using one of our parachute systems then you already care about safety. Have someone with you that can watch for trouble and eject the parachute if you have a problem. Let the pilot focus on the flying and getting the data. The Safety pilot can focus on making sure everything is safe.

Build for strength – The parachutes can put an immense load on your UAV if the deployment is at higher speeds. The large Iris chutes can withstand huge multiple thousand pound deployment forces. In the PUAV kits we provide rigging components and connectors that are all matched for the same strength. The goal is that there is no single point of failure. If you skimp on the shock cord size or other connections they will break.

NOTE: If you have concerns about deployment forces contact Fruity Chutes and we can help. All our large chutes come with slider rings that can help lower the shock load. Also we can make aero-sliders and other devices to help with this as well.

If looks like a mess, it is – If your installation looks disorganized and tangled then it is. Make sure harnesses and rigging stays in place. Using just a bit of masking tape to keep things organized works well. When you come up with a packing strategy that you like take photos so it's documented, and then ground test it.

Share how you installed your system – Let us know with photos how you did your installation! We can build up a library of these for folks to share.

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