PVS-69 GEN3 Delta.

this design requires the following printed components:

1X Dovetail

1X Bridge

2X Sensor caps (foxeer or runcam)please note there are +0 and +2.
I prefer using the +2 as it wides fov and gives me a better view of the tube.

1X right tube

1X left tube or a DVR tube.

1X Battery cover

1X Backplate.

For physical components, you will need the following. However please keep in mind you can buy the kit from my website containing all the hardware pieces except from the display and the cameras. It will definitely save you some money too!

11X M5x7 heat-set insert
https://amzn.to/3KTgOUw

11X M5x8 bolts. (for the dovetail a button head is recommended)
https://amzn.to/3jIG6Ja

2X starlight FPV cameras. runcam or foxeer work in this design.
https://amzn.to/3Epdyhh
https://amzn.to/3KSAuYJ

2X V760A-5 or V760A-3 displays. these can be found on eBay, expect a month for shipping. (Optionally there is now the V780A and the V770A) these have the same bodies but a better ocular lens I have not yet been able to test them

1X 3 position rotary switch. I use "Rotary Switch 16MM Selector Switch 3 Position Select Switch"
this can be found on amazon sold in a 2 pack
https://amzn.to/38KcJUv

1X 300x8mm OD of brass tubing. you will only use 100mm
https://amzn.to/3xuOuE7

1X 5.5x2.1mm DC female jack. this can also be found on amazon. I used the plastic one they are sold in a 5 pack
https://amzn.to/3KLofNA

1X AA battery terminals. these are sold in a 20 pack
https://amzn.to/3KSQGZZ

1X buck converter. I used the eBoot Mini MP1584EN DC-DC Buck Converter Adjustable Power Supply Module (6 Pack)
https://amzn.to/3KSzHHf

2X 10mmx2mm Nitrile Oring https://amzn.to/37mEOko

2X 13mmx3mm Nitrile Oring
https://amzn.to/3KRAmsA

5x 22x2mm Nitrile Oring (you can buy a multipack that has all three sizes)
https://amzn.to/3rrIp7N

1X 2x8mm rare earth magnet
https://amzn.to/3Ostkga

you will also need approximately 24" of wire I recommend black and red 24 AWG.

OPTIONALLY

If you would like to try the auto-shutoff function you will need

6X Rare earth magnets 2mmx8mm diameter
https://amzn.to/3Ostkga

2X .5A reed switches.
https://amzn.to/3rxym0O

2x 2N7000 mosfets.
https://amzn.to/3L2IyGg

1X custom PCB. this can be bought from me or ordered from PCBWAY.
It is not "needed" but I HIGHLY HIGHLY recommend it!

2x 10k resistor
https://amzn.to/36jRiJ6

A video build guide for the auto-off is coming soon
for now please enjoy this write-up of the standard setup without using a custom PCB.

start by inerting heat-set inserts into all locations.
4 per tube and 3 on the bridge. set the dovetail insert deep enough that plastic forms over the top of it

next, cut your brass tube down and make 2X 45-46mm lengths. this will act as the hinge pin for the tubes.
clean up any burs inside the brass.
ensure the brass fits in the bridge and backplate and can turn somewhat freely.

with the brass, tubes pushed all the way into the bridge slide on 1 10x2mm oring for each side of the bridge.

slide the cover on behind the oring.
looking through the bottom of the cover mark the brass you can see through the cover hole.
Disassemble and drill or cut out the brass tube where you marked.

To start assembling the bridge

Ensure the DC connector fits somewhat loosely in the hole on the right side of the bridge.
You need to be able to turn this jack.

Slide the rubber cover over the jack wires and then insert the wires through the bridge. then thread the nut on.
hold the nut down and rotate the jack clockwise to tighten the nut. be careful not to tear the rubber cover.

next, disassemble the switch. from the back of the switch, you should see 6 terminals.
2 marked 'C" 2 marked "NO" and 2 marked "NC"
using side cutters snip off the "NC" terminals

Using a pick or some tweezers you can remove the female terminals from
the wiring harness that comes with the switch

for the purpose of this write up blue will be NO and green will be C.
slide the wires onto their respective terminals.
(I suggest soldering the terminals on and covering them with heat shrink tubing.)

install the metal ring and castle nut into the bridge and set them over the hole for the switch.
thread the leads of your switch through the bridge ring and castle nut and using a pick or tweezers
turn the castle nut clockwise to tighten the switch into the bridge
(I find a 90-degree pick through the battery port works best.)

Now connect a 6" section of red wire to the positive "out" side on the buck.
solder the non-spring terminal to the red wire

now connect the positive and negative from the DC jack to the Buck on the "IN" side.

moving over to the common/green wires from the switch. cut one wire to be approximately 4 inches long.
Solder the spring side of the battery terminal to it.

solder the other green wire to the negative "out" side on the buck.

now connect the two blue/NO wires together and do a T Joint with 16-20 inches of black wire.
run that out either side of the bridge this will go to the tubes.

next, take a 16-20 inch section of red wire and split the casing in the middle.
twist that up and solder it through to the positive "out" side on the buck.
thread the wire through the bridge and out to the tubes.

at this point ensure all bare wire is covered up and there is no risk of shorting anything.
I wrapped my buck in electrical tape to be sure.
ensure everything will fit into the bridge without being too tight.

apply a small amount of glue to the cover where the brass tube will sit.
Insert the brass tube making sure the hole in the bottom of the cover aligns with the hole you cut in the tube.
on each brass tube/cover install a 10mm oring and a 13mm oring on the opposite end.

(if using the +2 covers ensure you do not mix up the left and right covers as they are not the same)

now thread the wire coming out of the bridge through the brass tube and out the bottom of the cover.

gently pulling on the wires to ensure it doesn't get caught in the bridge slide the brass tube into the bridge on each side.

Now you will need to connect a voltmeter to one of the leads coming from the bridge.
turn the switch to the side that does not have the spring terminal for the internal battery.
connect your battery source to the DC connector on the bridge.
(I do not yet have a Battery pack design completed but will soon)

you should be reading voltage when the switch is turned in the proper direction.
using a Phillips screwdriver adjust the potentiometer on the buck until your voltmeter reads approximately 4.8-5V.

Glue the spring terminal onto the backplate as close to the center of the circle as you can. and set the bridge aside.

Moving to the tube assembly you will repeat the following process on both tubes.

cut the wire coming off the display just before the first coil.
giving you approximately 5 inches of wire from the display.
using a razor carefully cut down the side of the black silicone casing about 1.5 to 2 inches.
you should see a red, white, black and green wire. strip these back about 1/2 inch
being careful not to tear the thin copper wire.

moving over to the runcam harness you should see a small pair of wires that are black and blue.
DO NOT CUT THOSE.

there is another small JST connector with a red, black, and yellow wire. snip off the connector and strip the wires back.
there is a free-floating blue wire. strip that as well.

from the camera cable.
connect the red and blue wire to the red display wire. and T that connection with a 4" red wire.
connect the black from the camera to the black and white wires from the display and T that with a 4" black wire.

finally, connect the yellow to green

now without soldering twist the red and black from the bridge directly to the harness you just made.
connect the camera and OSD keypad and power the system on.
The screen should flash blue and then power on and show the camera image.

The following settings are what I change on the night eagle.

change "day-night" to B&W.
turn AGC to the maximum.
in "system" change to PAL
the setting WDR is defaulted to LOW.
(turning this up can help the gain for NV but cause motion blur)
in system you can change the "RUNCAM" to a custom setting I do "PVS 69"

I do not have any recommended settings for the foxeers yet I will soon.

once you've made your settings changes you can unplug the OSD and camera.
insert the harness through the back of the tube running the two RED and Black T wires out the top and the camera connector through the slot in the front. at this point, you can decide if you want to have the OSD keypad externally mounted. if so drill a small hole in the flat area near the front of the tube allowing the OSD cable to fit through.

plug your camera into the connector and carefully feed any excess cable back into the tube so as not to get caught behind the cameras.

slide your display into the tube the two holes on the top of the display will align with the two holes on the tube. it is a very snug fit and should not require glue.
insert the two M3 screws that came with your display.

for the sensor cap
use the edge of a chisel o scrape away small amounts of the inside circle allowing the lens to fit snugly into the cap. before finally installing the cap install the 22x2mm oring on the threads of the tube.
make sure you focus your camera and set the lock ring in place before installing the cap.

once the camera is focused back it out 3 to 4 turns and install the cap. the cap should turn the camera lens back into focus. you may need to repeat this several times to get it perfect. now you can install the orings in the ring land at the mounting portion of the tubes and on the threads of the bridge.
connect and solder your leads coming from the tube to the leads from the bridge and push any excess into the tube. don't trim it in case you have to come back later.
bolt the tube to the bridge and you should be set.

put the rare earth magnet on the non-spring battery terminal. This will hold the terminal to the battery securely. 18650 has been hit or miss for me so I recommend using 2x CR123s.

install the backplate ensuring you don't pinch any wires. It's a tight fit!
one the backplate is in place tighten the two screws securing it.

next, install the dovetail to the top of the bridge. if the head of your bolt is too high for the mount you may need to grind it down or use a button head. I set my dovetail as far back as it will go to clear my glasses.