

The Art & Science of Designing a Dob (Am I doing this right??)

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If you don't have much experience building complex things, the prospect of building your own telescope might be a bit daunting. After reading Kriege & Berry's *The Dobsonian Telescope* twice and spending dozens of hours on different ATM websites, I decided "copy and modify" was the best strategy. With no previous experience building a scope, it clearly is wiser to stick to the proven. Ok, actually I did assist in the building of a portable 8" f5.0 "travel scope" that I toted halfway around the world to Fiji on a scuba vacation. So, I do have some idea what's involved and some hands-on experience. Mostly, I just bought the parts and helped when I had time; but I was up against a deadline. Still, I got a good idea of what I needed to think about in the bigger design.

Where to start? Kriege & Berry break everything down into manageable sections. You start with the mirror cell and box and the secondary cage. These parts hold the optics. You needn't have your optics to start. However, there are so many websites and designs to check out, your optics could well be ready before you start if you are the indecisive sort. I quickly ruled out the ultra-light, extra-spartan designs. They usually only have two poles and are not sturdy enough. I want to peacefully view through the scope, not wrestle with it or spend all night waiting for it to stop bouncing around. The low profile ones look best to me and there are plenty of designs in wood and metal. I haven't worked with metal at all and prefer the warm look of wood. Besides, wood is readily available and cheaper.

So far, so good.

Here are the criteria I decided on while looking at different designs:

I want the scope to be as light as possible and still function exceptionally well. I need to be able to:

- lift it into and out of my pickup without damaging the scope or my back, feet, fingers, etc. Handles would be a good thing.
- assemble and disassemble it without tools- no tools to fall onto the mirror, fall into the grass or anywhere else in the dark, roll around in my truck or be used for something else and not be available when I need it. **No tools.**
- *completely* assemble/disassemble it in less than 15 minutes. Let's face it- if it takes half an hour to set it up, I'll hardly ever use it.

I need to be able to do all of these things by myself.

It can't take up much storage space, there isn't much to give. I'm not really willing to park the Cougar outside so the scope can have its place in the garage.

OK. The first thing to figure out is the cell and mirror box design. I looked at a few different ideas and decided K & G's basic design would be fine. Their book is geared towards bigger Dobs- sometimes their tables include 12.5" scopes, sometimes not. I can always do the math to figure out specs they don't list.

I only need a basic 9-point flotation system to support my relatively light (18 lbs) mirror. Good- less stuff to make and put together. The way this works is pretty simple- three points define a plane. It turns out this is the best way to support a flat surface. It is also why you need three collimation bolts to adjust your mirror into the exact proper position. Typically, the collimation bolts serve as the three support points. Mirrors heavier than a few pounds need more than three points of support or the middle of the mirror will sag under its own weight. Yes, even 2" thick glass sags. If you put a

triangular pad onto each of the three points with three more support points on each pad, you have nine support points. You can add bars and more pads to get even more support points, if you have a bigger mirror. It is critical that the support points be placed so that each supports the exact same amount or area of glass. The collimation bolts come through two of the rungs of the tailgate; locknuts attach the triangular pad. Put furniture “no-slip” pads in each corner of the three triangles and voila! It isn’t as complicated as the pictures make it look. The book gives you the exact blueprint to accomplish this. I drew the triangular pads in autocad to take to the machine shop and have them made (lynda won’t be cutting her own metal). The “tailgate” (the bottom of the mirror box) is like a 3-rung ladder made of metal. Once you determine the inside dimensions of your mirror box, you’re ready to get the pads and tailgate pieces cut to your specs (or do it yourself if you have the means). Everything else you need you can get at the hardware store.

The thing for me to figure out was whether to add wheelbarrow handles to roll the scope around with or just regular handles. The mirror box with mirror should weigh less than 40 lbs. Hmm. Probably just regular handles would do the trick. I can add wheels later if it proves to be too much.

The next decision to make was to sling or not to sling. K&G advocate the old-school sling method which employs a car seat belt (or something like it) used as a sling to hold the mirror in place. Back in the day, they used to test mirrors that way. Nowadays, professional optics makers are more likely to use two points to hold up their mirrors as they test them. The glass warps a little when you set it on edge- as you would when you point your telescope at the horizon-it “potato-chips”. A sling supports the whole bottom edge of the mirror when it is on its side. This seems better than two-point support. On the other hand, you obviously will still get the top folding over with the sling. The two-point theory is like supporting a piece of paper on two points- the top doesn’t fold (but the sides might). I really have no idea how much deformity is involved or if it is enough to visually notice. Quite frankly, I don’t hear anybody in either camp complaining. More support seems better, but the mirror can move side to side a bit, which would mess with the collimation. Lonnie’s system doesn’t seem to move very much at all. I prefer doesn’t move as much and will go with Lonnie’s advice. This means adding a bar to the tailgate to hold the brackets.

Other considerations: open tailgate or closed? The open tailgate allows faster cooling of your mirror to ambient temperature. The closed tailgate allows you to spread out the collimations bolts making for easier collimation. That’s good, but you absolutely must have a fan to cool your optics. This is meant to be a low-tech scope, no tracking or computers. If I can avoid using electricity, I would prefer that. Perhaps I can figure out a design to only partially close the tailgate and get the best of both worlds. That part of the design can wait until I’ve put the tailgate together.

Another consideration is truss pole connectors- inside the mirror box or outside? Inside looks better to me- that’s an easy decision. Moon Lite makes wonderful truss pole connectors that don’t require tools and Lonnie has come up with a great connector for the part that attaches to the secondary cage- very simple. He gave me the design and specs and I’ll take that to the machine shop as well.

Leaving about 1.5” around the mirror gives the inside dimensions of the mirror box. Next, I dimensioned K & G’s tailgate design to accommodate my mirror. Plan out where you want to drill holes for the collimation bolts. I’ve decided to space my collimation bolts wider than they do for easier collimation and will put in an extra bar for the brackets. Several other people have tried this and I got different ideas from perusing different websites. The simpler the better for me.

The height of the mirror box will be determined by the height of all the stuff that supports the mirror plus 3 inches or so to keep out ambient light.

Now, I have the basic plans to start making the mirror box. Finally, I am at the point where I can actually say, “I’m building my own scope!” There are many more decisions to be made, but I can think about them later. That’s the nice part of “copy and modify”- the really hard things have already been worked out and you can hardly make a “wrong” decision.