Dobstuff's Lightweight Dobsonian Kits

A Big, But Lightweight Scope for Public Events

By Doug Reilly

Image 1 - The author's Dobstuff 10-inch kit in f/4.2 configuration.

In the last couple of years I've shifted my focus from personal observing to public outreach. Concurrently, I started using a digital setting-circle system (Sky Commander) to help find some harder-to-hop-to objects with an audience used to channel-surfing rapidity. My trusty 6-inch f/8 reflector continued to serve me well, mounted on a Half-Hitch alt-azimuth mount, which is indeed a luxurious way to mount a scope.

One of the things I noticed doing outreach was that most children needed some sort of a ladder to get to the eyepiece. This often made them uneasy, and inevitably some of them would wobble, try to grab the scope, which of course would swing away. Anyway, I needed to spot them and enlist their parents to help as well. I began to wonder if a scope that didn't require a ladder for the little ones might be a good idea.

Around the time that this idea was gelling in my head, I found out I had been accepted to the Astro VIP (Volunteer-in-Parks) program and would be a guest of the U.S. National Park Service at Capitol Reef National Park in south-central Utah for a month in the summer of 2011. I began to think that maybe a bit more aperture might be a good idea – to really take advantage of those deep, dark skies – as well as a good opportunity to put my kid-friendly scope plans to the test. Enter an old Meade 10-inch f/4.2 mirror bought on Astromart.com for a song and Dennis Steele's Palm Desert, California-based telescope company, Dobstuff.

About Dobstuff

Rather than offer a line of stock telescopes, Dennis' business model for Dobstuff focuses on what he calls "scope makeovers." Dennis figured that the first ungainly decades of the Dobsonian revolution littered the country with tons of overbuilt, very heavy telescopes, and that their aging owners would be increasingly unwilling or unable to drag them into the backyard, let alone to a dark-sky site far from the ever-encroaching light domes of our cities and suburbs. His makeover service takes the optics from these scopes (and to varying degrees some of the other components like secondary holders and focusers, depending on what's usable and what the owner wants) and puts them into a tidy, lightweight and well-thought-out tri-parallel-strut Dobsonian.

The Dobstuff website is rich with im-

Image 2 - Brandon Geisel's (Tripodpads.com) tough, vibration-reducing urethane tripod pads were installed in place of more-standard Dob feet.

Image 3 - The Dobstuff kit arrived safely protected in two well-packaged boxes.

ages of made-over scopes and testimonials from customers satisfied with Dennis' weight-reduction program. Dennis also offers kits, which are basically all the wooden parts and components needed to construct a telescope. Buyers need only sand and finish the parts, glue them together and assemble the scope.

Dobstuff's prices are surprising given the quality of the wood and components Dennis uses, and especially so if you consider the prices some premium-telescope makers asked for similar designs in the recent past. In fact, Dobstuff's scopes neatly fill a market niche for portable Dobs that exists between the mass-produced and the high-end premium (and often custom-made) truss Dobs.

Dennis' telescopes utilize three aluminum poles in a parallel-strut configuration. Further description of the design won't do as well as a single image (see **Image 1**).

The Tri-Parallel-Strut Design

I was curious about the origins of the tri-parallel-strut design. Just as Dobstuff's scopes seemed to occupy a middle-ground in the Dob market, their design also seemed to occupy a middle ground between the classic Berry-Kriege truss Dob, and all its variants, and the superlight "travel" scopes that seem to be all the rage in Europe (which appear to have a common ancestor in the innovations of France's Paul Strock). The tri-parallel-strut design represents a common-sense, no-more-than-necessary approach that reveals something deeper than the "bigger is better" American design philosophy that gave us the Hummer for soccer moms. So where did it come from?

My only conclusive finding is that I'm no private investigator. One of the proselytizers of the design, Steven Overholt, traced out its lineage in his immensely quirky and entertaining self-published book, *A Telescope is a Space Ship*. According to Overholt, the first parallel-strut telescope to make a splash in the stargazing-public consciousness was Jim Steven's four-strut, 17.5-inch Dobsonian. The "splash" in question was the discovery by Tom Bopp of Comet Hale-Bopp in 1995, using Jim's scope. By the late 1990s, Albert Highe was making tri-parallel-strut telescopes, and Michelle Plettstone started selling them commercially. Dennis Steele was in the same telescope-making circles as Albert and Michelle. Further digging through Albert's archived Web page reveals that he was inspired to explore the parallel-strut design by Ron Ravneberg's 8-inch travel telescope, Alice, made in 1990. Ravneberg himself cited earlier work by Thane Bopp, Dick Suiter, Tom Burns and Bob Bunge.

So the tri-parallel-strut design seems to have no clear inventor; rather it coalesced from the work of many people. I'm happy to throw out the "Great Man in History" theory in this case; I like the idea that this sprang not from a single genius but rather from the collective work of many ATMs working in isolation and community, borrowing, developing and sharing their ideas. Nobody owns the design, but plenty have found it to be a sturdy way to construct a lightweight telescope.

My Design Goals

I wanted a large-aperture scope (in this case, I settled on 10-inch – remember, I was reared on a modest 6-inch – and 10 inches represented a feast!) with a fast-enough focal ratio to keep the eyepiece near enough the ground for most children to view flat-footed and without a stepladder.

I also wanted to keep the scope as compact as possible, seeing as I would have to load it up into a Nissan Versa, along with a lot of other gear, for my trek cross-country to Capitol Reef. Dennis makes what he calls an "Easy Transport Telescope" option, which basically cuts the storage size of the truss poles in half by introducing an inter-

Image 4 - The author's colleague, Peter Spacher, cuts triangle sections from the sideboards.

Image 5 - The main components of the kit are prepped for multiple coats of Ikea's user-friendly Behandla finish, a mixture of beeswax, linseed and tung oils.

mediate wooden ring. Broken down, you have six shorter poles instead of three full-length ones. I wanted to take this a step further: What if you could nest the upper set of three 1-inch diameter aluminum tubes into the lower set of 1.5-inch poles? Dennis usually recommends the 1.5-inch poles for a 10-inch scope, but since only half of the structure would be made from the smaller tubing, he concluded that stability would not be overly compromised.

This solution presented a challenge, however. The usual manner of attaching the poles to the rings (threaded inserts) wouldn't work in the case of the top of the lower poles, since the tube needed to be open to nest the upper poles, so we had to look for an alternative manner of affixing

Image 6 - The author constructed a "bed of nails" for suspending the components as the newly-applied finish coats cured.

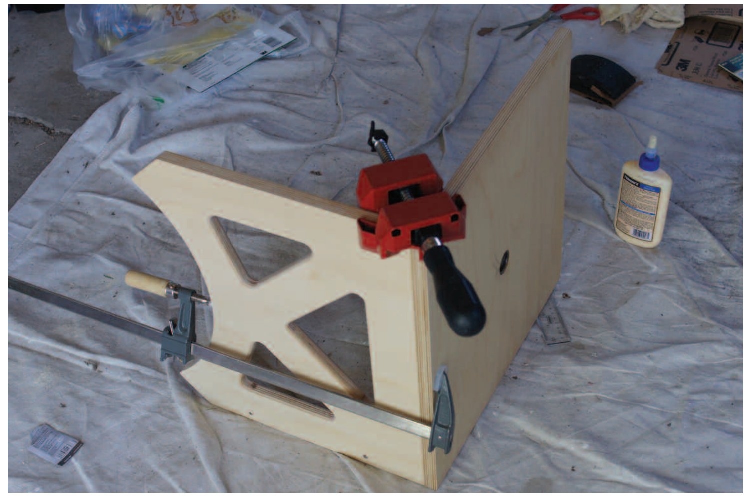

Image 7 - The rocker-box pieces are held in place with clamps as joint glue sets.

the lower poles to the rings. We found it in an idea utilized in a 10-inch travel scope made by ATMer Eric Shrader: a captive wooden clamp. Dennis thought the idea through and came up with a tidy way of integrating the captive clamps into the intermediate ring.

The craziest idea I had was to try to implement an eyepiece turret in the upper tube assembly. I had an older Vixen turret designed for the straight-through viewing popular with Japanese refractor owners, with three ports for 0.975-inch eyepieces (18-mm, 12-mm and 9-mm Orthos were my choices) and a single 1.25-inch port (for a 20-mm Pentax XL). I mated the turret via a 1.25-inch nosepiece from Borg with a low-profile 1.25-inch helical (non-rotating) unit, also made by Borg for its line of modular refractors. I purchased the focuser as well as a 1.25-inch eyepiece adapter from Astro Hutech in California. Ted Ishikawa was, as always, helpful and prompt.

At some point in the design phase, I stumbled upon an ad for Brandon Geisel's urethane tripod pads (Tripodpads.com). While designed for tripods, obviously, I had another thought: Dob feet. I know that some people use hockey pucks and other people use rubber furniture feet and still others use blocks of wood, but I though the urethane pads would have some advantages – namely the same vibration dampening qualities that make them useful for tripod-mounted telescopes. Brandon was kind enough to donate a set of pads for the cause. You can see them on the scope in **Image 2**.

The Build

A few weeks after Dennis wrapped up the design phase, I found two large boxes waiting on my doorstop (**Image 3**). One held the truss poles and hardware, the other the wooden pieces. Dobstuff uses the industry-standard furniture-grade Baltic-birch plywood. The pieces were cut out cleanly and precisely and, as advertised, needed very little sanding. Dennis had asked me during the design phase if I wanted circular cut outs in the rocker box. Although I thought these were a good idea to reduce some weight and provide some hand-holds, I wanted a different design, something to set my scope apart. So the rocker box pieces arrived solid.

I got some help from Peter Spacher, the physics-lab director at the small college where I work (**Image 4**), who has a machine shop at his disposal – very convenient! I drew a pattern of three triangles on each sideboard and rows of smaller circles on the front board. While Peter milled out the triangles I cut out the circles using a 2-inch Forstner bit on a drill press and then added some holes to the azimuth base board and the mirror box's bottom board as well (**Image 5**).

The standard for most wood finishers these days is polyurethane. While I don't have anything against it (rub-on poly is very easy to use), I have in general been trying to limit my exposure to nastier chemicals and complicated cleanup. I also wanted my daughter to be able to help me with the project (she was eight years old at the time), so found a product from Ikea called Behandla, which is essentially a mixture of beeswax, linseed and tung oils, and a bit safer to handle than other finishes. Ikea even lists it as food-safe. It also has a smell that I find to be quite pleasant, goes on with a clean rag, dries quickly, and gives the wood a nice luster without making it look like it's been encased in Lucite. So far it has proven durable, and it can be easily refreshed if need be.

After the pieces were sanded, I created a "bed of nails" out of some scrap plywood and thin finishing nails (**Image 6**). This was designed so that I could coat the entire piece of wood and place it on the nails to dry. I put five coats of the oil on the wood before I was satisfied with the finish.

I glued the rocker box together and held it fast with clamps (**Image 7**) and glued the Ebony Star laminate to the bottom of the rocker box and altitude bearings with contact cement. There was no getting

Image 8 - A universal primary-mirror cell from Compact Precision Telescopes (leftover from another project) was reused with the Dobstuff kit. Three holes were drilled in the base of the mirror box to pass the cell's collimation bolts.

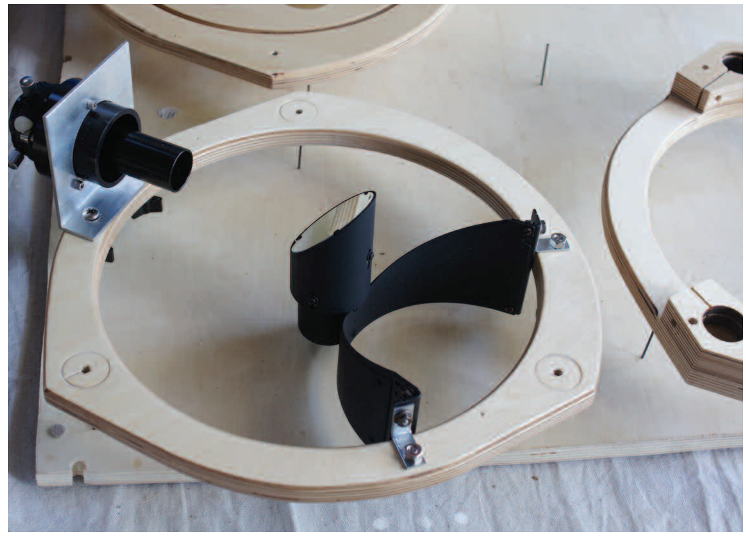

Image 9 - Also leftover from a previous project was a curved-vane secondary spider from ProtoStar. L-brackets attach the spider to the upper-tube assembly.

around that nastiness! One standard tip for working with contact cement bears repeating: Coat both the Ebony Star and the surface it will go on with contact cement and let both pieces dry. Then and only then stick them together. You're more likely to get good adhesion that way. I added screws to the ends of altitude bearing strips (although one of them has since separated from around the screw and is calling out for more glue).

My only mistake was not spending more time squaring the rocker box. The sides are not exactly parallel and this can create a little unevenness in the altitude motion. A little time tweaking the *Teflon* pads and this flaw's effect was minimized. Had I to do it again, I would work harder to ensure the sides of the rocker box were perfectly parallel to one another. Live and learn – and move on to other mistakes.

One of the best investments I made in specialty tools (about $25, I think) was for a simple handheld pipe cutter. This is basically a clamp with a set of wheels on one side and a wheel blade attached to a screw on the other. Put it around the tube, tighten the clamp to engage the blade and spin it around the pipe, tightening the blade with each go-around. It's a brilliant little device and invaluable for trimming round tubing.

Although Dennis makes mirror cells in a wide variety of types, I had a universal cell from Compact Precision Telescopes leftover from another project, so I reused that. All I needed to do was drill three holes in the base of the mirror box for the collimation bolts, and the mirror was ready to install (**Image 8**).

The trickiest part of putting together the telescope was adjusting the balance point. The altitude bearings need to be located properly on the side of the optical-tube assembly (OTA) and this took some trial and error. I had drilled a series of holes 1.0 inch apart on the wooden slats that hold the bottom of the altitude bearings onto the mirror box (the upper parts are fastened to the poles with clamps, so are easy to adjust).

Also leftover from a previous project was a curved-vane secondary spider from ProtoStar. This is a single-curve design that you don't often see implemented on open-tube telescopes. I tried to make a go of it and found that a few L-brackets from the hardware store worked out nicely, providing just enough tension and proper spacing. You can see the results in **Image 9**. The curved-vane spider is one of my favorite things about the telescope, neatly diffusing the diffraction caused by the vanes to a barely perceptible haze around only the brightest of objects. But to be honest, I never much minded the diffraction spikes caused by the more-standard three or four straight vanes.

You'll note also in Image 9 the angle-iron focuser board and a KineOptics HC-2 "Helical Crayford" focuser. I didn't have the turret assembly entirely worked out at that point, but had the HC-2 lying around, so it did the trick in a pinch. By the way, the HC-2 is a very effective, super-lightweight focuser.

Shortly after I completed the scope and had first light, I implemented the turret (**Image 10**).

At my request, Dennis included hardware to connect my Sky Commander encoders as well as a nifty post for mounting the Sky Commander computer. I ran the computer's control cables through the post to make it look a little neater. The scope's balance point was well below the altitude bearings, so I added a right-angle correct-image (RACI) finder on a TEC base to the upper tube assembly, along with the classic Telrad. Using ProtoStar's awesome flocking

Image 10 - An eyepiece turret from a Vixen refractor carries an assortment of eyepieces on the f/4.2 version of the scope.

Image 11 - A JMI Reverse-Crayford focuser was ultimately intalled with the f/7 version of the scope. A Borg helical focuser provides ultra-fine focus adjustment and serves as a focus-tube extension.

board, I crafted a baffle for the mirror box and another for the upper tube assembly.

The Scope in Use

First light was great fun. The scope performed as I had hoped, and I had to sit down to see through it comfortably! I did a test run of the scope's portability during a punk show at our theater a week or so later; the scope was easy to transport and set up, and movements were smooth. In my city's terrible downtown light pollution, I struggled to even find Saturn. A time-lapse movie of my setting the scope up and taking it down is available at http://www.youtube.com/watch?v=Sc0SyABRn3M.

A few weeks later, I packed the scope

into my Versa for the long trek to Utah, and four days later I pulled into the park to begin my month of service. The scope spent a lot of time in my car and withstood the bumpy roads well. One thing I learned is that rutted dirt roads seem to have a magical effect on fasteners – I had to retighten just about every screw on the scope.

During my first public stargazing event at the park, I saw that my primary design objective had been met: children could look through the scope and almost never needed any sort of boost. I was pleased. But then an opposite problem revealed itself: I had the scope set on Saturn and a lady who was a bit advanced in age moaned audibly as she bent down to look through the eyepiece, her knees making a noise that sounded much like an old boat creaking on the water. Luckily she got back up again. I invited guests to use my observing chair, but found that not everyone could sit and stand easily; most refused to use it and simply bent over instead.

This flaw was entirely my fault. I had paid attention to the needs of young observers while not considering the needs of older visitors and, moreover, failed to recognize that I'd often be dealing with both old and young in a single group.

Take Two

This aside, the scope and I had a great month in Utah. People had a good time under the stars and nobody's knees actually gave out. When I got home, however, I saw an ad on CloudyNights.com for a 10-inch f/7 mirror, and I jumped on it.

The three-pole design is very easy to reconfigure. In terms of hardware, I primarily needed a new set of poles and inserts to lengthen the OTA. I had to forgo the nesting pole idea though for worry that 1.0-inch poles might not be rigid enough for an OTA of such length.

The longer focal length and resulting OTA also introduced a different balance point, and suddenly I needed extra weight on the bottom end. This was solved by attaching a 12-volt battery to the mirror box

Image 12 - The f/7 version of the scope is significantly longer than its initial f/4.2 configuration, but remains sufficiently rigid to firmly hold collimation.

Image 13 - The author's daughter assisted in applying the Behandla finish to the wood components and in assembling the completed scope.

and lightening up the upper tube assembly, and that meant removing the RACI finder and the turret. I also added a spring tension on the side opposite to the DSC-encoder arm; I've used such springs for years to increase the friction a little bit on the altitude axis, and this one provides just the right feel. In order to keep the new OTA as short as possible, I choose a higher-profile focuser. My solution was to use a JMI 1.25-inch Reverse-Crayford focuser (RCF) with the Borg focuser and 1.25-inch nosepiece acting as both fine-focus control and focus-tube extension. The RCF-mini, as it's known in the JMI catalog, is a brilliant little piece of engineering, and I can see why they are popular with ATMers making smaller-aperture travel scopes; well-made, precise, smooth, tiny, and lightweight (**Image 11**).

The original Meade 10-inch f/4.2 primary mirror seemed to be quite good. My secondary was undersized and I believe that led to a bit too much light fall-off, and I felt therefore that the scope never delivered to its full potential. The new longer mirror, which came originally from APM in Germany, changed everything: It is one of the most stunning optics I have had the opportunity to use. So my shorty, deep-sky kid's scope has become a great planetary scope that even some adults need a little boost to look through when at zenith (**Image 12**). The best-laid plans!

The longer OTA really helped me test just how far the three-pole design could be stretched. The f/4.2 version showed almost no flexure at all, but would the f/7 version do? I placed a laser collimator into the scope with the OTA pointed close to the horizon, collimated it and then raised it slowly up to zenith, all the while watching the laser centered on the primary and folding back on itself. Any flexure of the structure would show as the laser drifting off. If it did drift, it was not noticeable. My conclusion: The three-pole design is VERY rigid! I have seen it with my own eyes and I am a believer.

The extra length and weight were also

a greater challenge on the basic engineering of the scope. I'm happy to say it remained very smooth, precise, and even though there was slightly more settle-down time at the eyepiece than with the shorter version, I'd still call its performance quite good. I'm not sure to what extent the urethane pads are contributing to this, although I can say that, especially with the much longer OTA swinging around, I appreciate the larger footprint the pads provide, which makes the scope much less likely to topple over.

As mentioned earlier, I work for a college and had a chance to try out the f/7 version of the Dobstuff scope this fall while helping out with the introductory Astronomy classes' observing nights. While not children, the students all had to use a stepladder at some point or another, but it was just a step or two, and all of them did fine. I'll be back to spotting the littler kids once the star-party season starts up again, but they're far less damageable when dropped, and the adults will not be secretly cursing me. Indeed, they'll be too busy looking at all that detail on Jupiter.

Conclusion

I couldn't be more pleased with the versatile Dobstuff kit. Dennis Steele is an excellent craftsman, and his design is well thought out, very sophisticated, and represents what I think is one of the best bangs for the buck out there in Dobsonian telescopes at present. I would recommend his kits without hesitation for anyone with a beginning-to-intermediate level of wood finishing skills. My 8-year-old daughter even got involved in the fun of putting it all together (**Image 13**).

The bottom line: in my mind, the three-pole design used by Dobstuff often supplants its more complicated kin and represents a happy balance between portability and stability. I recommend the design, and I recommend Dennis Steele's Dobstuff as a source for great information, inspiration, parts, kits, or even a complete telescope makeover. ATT