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The Teeter's Telescope 14.5-Inch Truss-Dob

An Evaluation of a Teeter's Dobsonian Structure

By Phyllis K. Lang

This article is intended to serve as a critical look at the Teeter's Telescopes truss-style Dobsonian telescope. In particular, I evaluate custom-build #70, a 14.5-inch f/4.5 Ultra-Limited Edition delivered to me in October 2010. My goal in writing this article is to document the build quality and point out details that may be particularly interesting to telescope makers and advanced visual observers. This article explores the telescope structure only.

My experience in telescope building includes assisting in building an 8-inch f/7.6 Dobsonian with a solid rotating tube and rebuilding a solid tube Tectron 20-inch f/5 Dobsonian into a truss design. In addition, I taught telescope mirror-making for 17 years at North

Carolina State University and have 25 years visual observing experience with telescopes. I enjoy deep-sky observing with an affinity for planetary nebulae.

Fit and Finish

The fit and finish of Teeter's Telescopes enjoy a very positive reputation. While the finish is easy to evaluate, the fit determines how the telescope will perform.

A careful visual inspection of the woodwork confirmed that all joints were tight and the hardware was mounted securely. I carefully measured hardware installation and the squareness of the structure with a drafting ruler and steel tape to make sure that collimation would hold to expected tolerance. The greatest

error in the centering of the spider in the upper tube assembly was one half millimeter. The greatest error in the centering of the mounted mirror in the cell from the sides of the mirror box was a little less than one millimeter on the ground side of the cell. The primary cell was placed perfectly parallel to the top of the mirror box. The distance from the top of the mirror box to the bottom of the upper tube assembly was equal all the way around. Finally, the spider was mounted precisely parallel to the bottom of the upper tube assembly.

Rob Teeter has made the cherry finish a signature feature of his telescopes. While the cherry finish was gorgeous, I wanted a lighter color that would reflect heat a little better and not show dust. I



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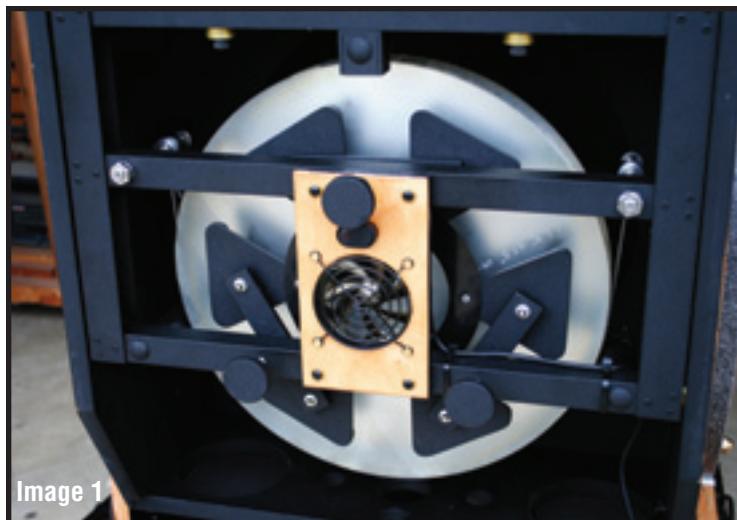


Image 1

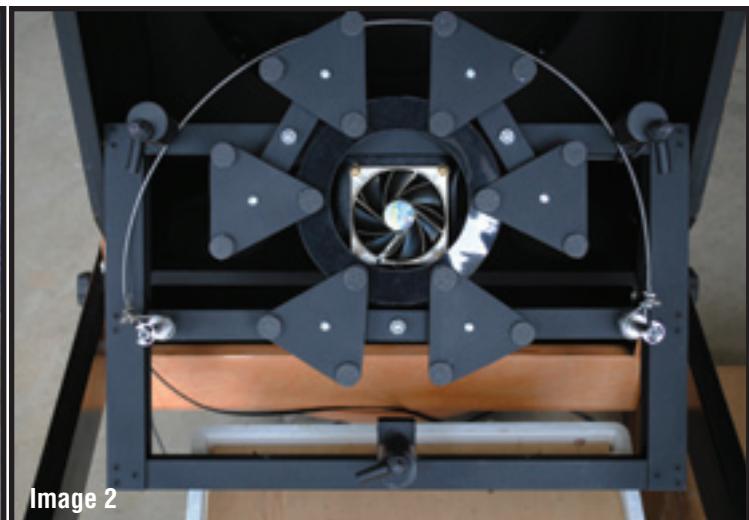


Image 2

chose the light maple stain at Rob's suggestion, and the result was beautiful.

The Mirror Box

The mirror box and rocker box are made of 3/4-inch birch plywood. It is solidly built and heavy for me to move alone. Fortunately, my husband is ready and willing to help with the heavy lifting.

My previous 20-inch Dob was also built with 3/4-inch plywood. I prefer the heavy structure because vibration from wind or hand movement is harder to induce and damps out more quickly than a lighter structure. I also believe the stiffer structure holds critical collimation better.

A small fan is mounted behind the

primary to assist with cooling. It is an upgrade to the standard kit. It is neatly installed with wiring fastened with wire clips and an LED-lighted switch just beneath one of the collimation bolts. The fan is a quiet and blows 32 cfm. It induces no vibration at all into the optical system. I highly recommend this upgrade for use after the boundary

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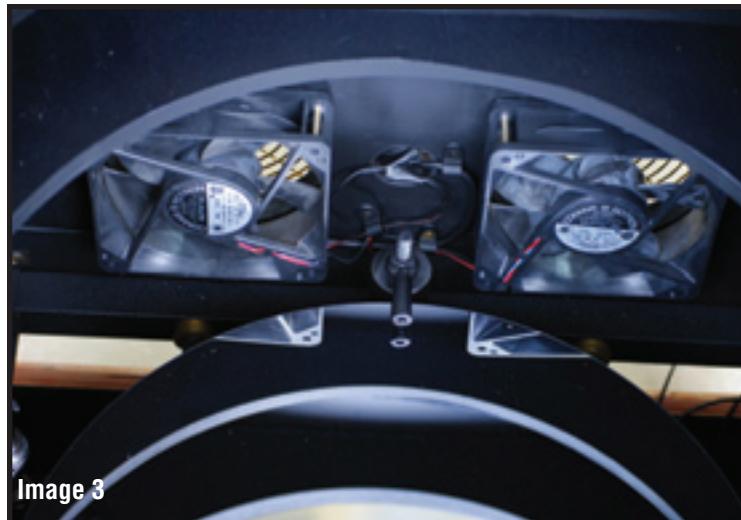


Image 3



Image 4

layer fans have done their job.

The Primary Cell

The primary cell is made of 1.0-inch box-tube aluminum and 1.375-inch channel aluminum. The welds are clean and the riveting is tight. It includes an 18-point floatation system for the 14.5-inch thin Pyrex mirror with adequate

travel on the collimation bolts. These collimation bolts have large knurled-steel knobs that turn very smoothly, allowing precise adjustments to primary mirror collimation. The cell is mounted firmly to the 3/4-inch plywood mirror box. **Image 1** shows the rear of the mirror box: cell, primary and rear fan shown

The Tailgate Assembly

The cell hinges out and down to allow the mirror to be removed. **Image 2** shows the Glatter Cable Sling System, the 18-point floatation system, and the mirror retaining clips turned to permit mirror removal. The tailgate hinges on bolts buried in the sides of the mirror box. The tailgate is secured with 9/16-



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Image 5



Image 6

inch bolts through the mirror box and the aluminum frame of the cell. This cell isn't going anywhere, and neither is the mirror when the clips are rotated to the "closed" position.

The Boundary Layer Fans

The twin boundary layer fans pull air into the mirror box, blowing down

and across the face of the primary mirror (**Shown Image 3**). Two holes are cut in the mirror box opposite the fans to allow the moving air to drain. I debated the value of boundary layer fans years ago with my fellow mirror-making and telescope-making buddies. We determined then, and I remain convinced now, that breaking the boundary layer with fans

improves the quality of images significantly when atmospheric seeing is excellent. Image 3 shows the mirror box interior and boundary layer fans.

These fans are intended for more than breaking the boundary layer. I call them turbo-blowers because they deliver 110 cfm each and cool the mirror box interior. I can attest that running the fans

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for 30 minutes after setup and before observing improves cooling of the primary and mirror box significantly. The fans induce vibration into the mirror box structure that definitely affects images. Teeter's Telescopes does not recommend running these fans while observing, and I agree.

Push-To Motion

I am a “push-to” observer so the motion on the altitude and azimuth bearings is important to me. This telescope employs *Ebony Star* laminate and generously sized PTFE pads for the bearings. The azimuth bearing includes a large PTFE pad in the center. The motion in both altitude and azimuth is smooth. I have not decided whether the amount of “stiction” is perfect or just a tad too much in a high-power (e.g. planet) observing scenario. This is a critical adjustment in my experience – I once applied some Armor All-brand treatment to an azimuth bearing that resulted in an unusable tele-

scope. A friend recommended pure carnauba wax which I have found to be a better solution. If I do anything to the bearings, I will apply a small amount of carnauba wax.

More About the Mirror Box

Nice touches typical of this telescope include the clamps that secure the fan wires, flocking material on the light baffle above the primary mirror and soft rubber bumpers on the mirror clips. Wiring is neatly controlled throughout the telescope. The flocking material is trimmed neatly and is installed with no bubbles or creases. The dust apparent in some of the photos is



stuck to the flocking material and can be blown out with an air bulb which I keep with my observing equipment.

The mirror clips stay positioned to keep the mirror from tipping out of the cell when the telescope is horizontal. They passed an unintended test of this on the telescope's second night out: the telescope tipped past horizontal while





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Image 5

moving it with the wheelbarrow handles. There was no damage, but the mirror slipped forward in its cell. Once it was

repositioned properly in the cell, the clips gave ample clearance between glass and bumper. If a mirror fits tightly in the cell

or sling, the glass is pinched resulting in astigmatism.

My previous 20-inch f/5 Dob (ca. 1989) had a seat-belt sling in it. While the belt was serviceable for years, I had problems with it slipping. If the belt wasn't positioned correctly, astigmatism became apparent in the image. The old-style seat-belt slings were also susceptible to stretching.

The Glatter Cable Sling System is a recently-developed solution to both problems and is available as an upgrade to the standard package. **Image 4** shows the mirror box interior and cable sling close up.

I use digital setting circles (DSC) in my "push-to" observing. The DSC swivel bracket (**Image 5**) is an upgrade that allows my DSC computer to be attached with Velcro-brand fasteners to an adjustable, convenient mount on the telescope. I can operate the DSC without detaching it and it remains at arm's reach from the focuser. This is a recommended upgrade if you use a DSC computer.

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Ball-&Socket Truss-Pole Connectors

The ball-&-socket connectors for the truss poles (**Image 6** shows the Moonlite Telescope Accessories truss pole connectors) are a huge improvement over the full-capture assemblies I used in the past. Truss poles slipped occasionally in the capture-style assemblies causing real problems at collimation time. The balls on the new telescope's truss poles fit nicely in the sockets. My greatest concern is that the steel screws that tighten against the hard Delrin-brand-plastic balls will flatten out spots on the balls causing a misfit. Time will tell whether that becomes a problem; otherwise, this is a beautiful solution.

The Truss-Ring System

Teeter has an innovative system that joins the upper tube assembly to the mirror box, and it can speed up setup by as much as 10 minutes. Truss-pole connectors are mounted to the upper tube assembly as usual, but the connectors on the mirror box end are mounted to a 3/4-inch plywood ring that bolts onto the mirror box. This allows the upper tube assembly and the truss poles to separate from the mirror box as a single unit. **Image 7** shows the truss-ring system mounted on mirror box and **Image 8** shows the truss-ring system separated from mirror box. The fit of the ring to the mirror box is tight and is secured by large rubber-coated hand knobs. This system is really convenient and rigid enough not to



Image 6

affect collimation. Of course, if you need to break the telescope down further, the truss poles can be removed from all connectors and stored separately.

The Upper Tube Assembly

The upper tube assembly (UTA) is also solidly built, but it can benefit from a single, simple change.

The AstroSystems spider was centered in the UTA and the secondary holder was fastened tightly on the spider. Even so, the secondary holder could rotate within the spider with hand pressure, so I added a split washer between the nut and the flat washer that secure the secondary holder to the spider. Problem solved.

The secondary holder has four collimation screws that are easy to adjust with fingers (no gloves). The secondary holder also has a secondary dew heater to help with heavy seasonal dew here in North Carolina. The wiring is neatly routed on the spider with particular attention to flatness. The amount of diffraction induced into the image is minimal due to this careful detail.

Image 9 shows the circle of flocking material opposite the focuser in the UTA that comes with the standard package. I inserted flocking material into my other telescope a few years ago, and I highly recommend this simple step to improve contrast in reflecting telescopes.

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Image 8



Image 9

Collimation

I tested the telescope's ability to hold collimation while moving it in altitude from zenith to horizon, and I observed a troubling shift of several millimeters in the beam of a laser collimator within the center spot on the primary mirror. I feared that this was due to flexure in the cell or the tube structure. Having made

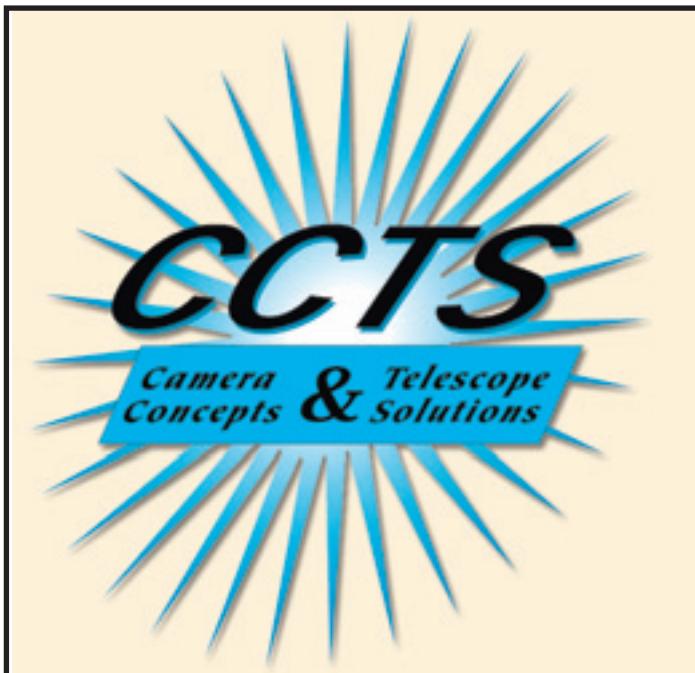
careful measurements of all components, it was not readily apparent what might be causing the shift, but it was large enough to affect images noticeably.

I talked at length with one of my mirror-making friends who pointed out that the problem may be in the focuser or the laser collimator itself. I verified that the laser collimator beam was collimated

within the housing, so I removed the laser and inserted a Cats-Eye 2-inch Infinity XLK autocollimator. I watched the hotspot pattern in the autocollimator as I rotated the telescope on the altitude bearing. There was almost no movement, proving that the problem lay in flexure of the laser at the focuser, not in the telescope structure itself. Further experiments showed that when the collimator was in the focuser's 1.25-inch adapter, the shift was huge – up to a centimeter. When the collimator was in its own 2-inch adapter and fitted very tightly in the focuser, the shift was tiny – not really measurable.

Conclusion

I am delighted with this telescope. Having examined it with a millimeter ruler, a carpenter's square, a laser collimator and an autocollimator, I am confident that I have a well-built, sturdy telescope that should perform extremely well. ATI



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