My Simple Aluminum Dobsonian Telescope

(Or what to do when an amateur astronomer retires) by David Shouldice

The problem with astronomy and aging is that the desire for more and better views collides with my ability to manhandle a telescope. I wanted a bigger scope and when the sky is gorgeous and the seeing is good I just wanted to sit and watch the moon and planets and tour the dark skies for nebulas and galaxies - I didn't want to haul 100 lbs over to a field or bench press it into my car. I didn't want to take 20 minutes setting it up or wait a half hour for it to cool down and I didn't want to buy a van to haul it in. To simplify my dilemma, the telescope needed to be portable, quick to set up, cheap and, oh yes, I wanted it to track the stars. Sadly I have no machine shop at my disposal but, and there is a big but (no pun intended), I had more time than money.

With all those requirements, I first concluded that I needed to have a scope that could survive being left out in the weather. That solves the problem of the half hour cool down time and gets it out of the family room when my wife is tired of looking at it. That excluded wood, and left aluminum. Next, I had to figure out how to make the optical path collapsible and strong. The common triangular truss tube structures used on Dobsonian telescopes are very light and strong but do not collapse and require assembly and disassembly.

I chose an aluminum surveyor's tripod from Home Depot for the optical tube. The tripod legs conveniently extended close enough to my 60" focal length.

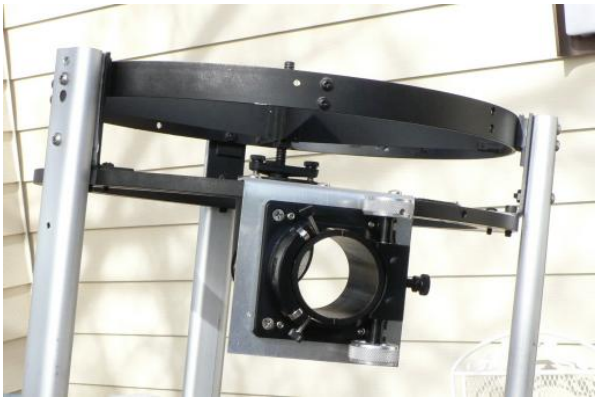
I should explain at this point that I had a starting place for the design. In its previous incarnation, I had the lovely 12.5" mirror in a 14" fiberglass tube on a Losmandy G11 German equatorial (read "really heavy") mount. It was a monster. The optical tube had exceeded the 60 lb. weight rating of the mount (the G11 itself weighed 75 lbs) and it would stop running when it got too cold.

So I started with a great mirror, mirror cell, secondary and spider.

What I created is a lightweight, 50 lb., very portable, collapsible (fits in the back of my car), easy-to-collimate 12.5" mirror telescope that can be left out in the weather. Its length can be easily adjusted for my bino-viewer or my webcam, but it is mostly a fast-to-transport (with my added clip-on wheels), easy to set up, reasonable aperture, cheap aluminum telescope. It has no wood to worry about warping in the heat or cracking or delaminating. Needless to say, it's durable.

I also added an aluminum equatorial tracking table to allow me to do high power planetary work or photography. The tracking table also has the ability to allow the public to view a high power object without my constant diddling to track a planet, but that is another story.

If you are interested in amateur telescope making (ATM), here is how I did it:
I started, as many of you would, at Home Depot. They had a surveyor's tripod that was just the right length for my mirror's focal length and my desired collapsible trusses. The legs conveniently attached to the bottom of the 3 mirror cell's mounting screws.



The secondary cage was somewhat straight forward. I bolted a 14" aluminum lazy susan and a strip of rolled aluminum with right angle brackets to attach the top of the tripod legs. This allowed me to attach the spider to the rolled ring, and a make a simple right angle bracket for the focuser. This ended up with a surprisingly rigid secondary cage.

The problem now was constructing and rigidly attaching an altitude bearing to the bottom. These bearings rotate at the center of gravity of the tube and allow the scope to pivot from horizontal to vertical. If I figured it right, my balance point was 16" from the bottom of the mirror. If I made the bearing's radius small, I needed a rigid 16" high base to support it. If I made a big 16" radius bearing, the base is small and easy to make rigid, but the bearing gets much larger.
I went with a larger radius. I made it from a piece of square 1" aluminum tubing rolled to a 12" radius. (Both this and the rolled ring were made by a sheet metal company in town). The trick was attaching it to the 3 legs. I took another piece of 1½" aluminum strip. I attached it from the bottom of the surveyor's tripod legs (and mirror cell) using a U shape giving two parallel sides, which would give a place to connect the attachment plate for my altitude bearings. Adding some aluminum cross braces for stiffness, and attaching the top of the altitude

bearings to the side tubes was all it took to make a lightweight but rigid assembly.

Next, I needed a rocker box assembly for all this to sit on. Following guidance from Dave Kriege's book (The Dobsonian Telescope), I made four angled supports for the altitude bearings (Teflon covered) that sat on a square base made of 1" square tubing. I braced the corners with sheet metal plates and used rivets to attach the plates to the tubing. For added structure, I attached a lazy susan ring below the square base and covered it with Formica to give a smooth rigid surface for the azimuth bearing.

The rocker box assembly rotates about the ground board and is supported by 3 Teflon pads above the feet. It, like the altitude bearings, are covered by Kriege's recommended Wilsonart "Ebony star" laminate material. The two pieces are bolted together to allow it to rotate about the center.

In the past I would have made all the base parts from ¾ inch laminated plywood, but now I used 1" square aluminum tubing corner braces and rivets.

Now, that description was only several paragraphs long but it took me more than a year of staring at the half completed design and searching the web to see how others solved the same challenges.

For the finessing and completion, I added a shroud made of ripstop nylon that sits on the inside of the tripod tube that is held erect in a column by three rings. I stole these from a collapsible clothes hamper. (Don't tell my wife). I Velcro'd it to the secondary cage, and to the mirror cell. Also, there is a separate ripstop nylon secondary cover to block stray light from getting to the back of the focuser.

Finally I added an aluminum "U" channel to the back of the rocker box with clips to hold in the axle with wheels for easy lugging. I also added some keepers to hold the mirror box and optical tube together when transporting.

I have been finessing some of the design to make it stiff enough to handle a wind, and have been readjusting the balance point now that all the parts are in place. The scope is quite nice and portable and very easy to transport. It is just what this aging astronomer had desired. Sometime later I will tell you how I made the aluminum equatorial table that it sits on.

I get many compliments from the people and families that get to look through my scope at public star parties. When people ask me the brand name of the scope I tell them in astronomy, unlike most hobbies, you can build your own equipment from scratch.

I had it out on my driveway for Halloween to show off the stars to the neighborhood kids and their parents. It is such a pleasure to use since it is so easy and fast to set up for viewing. When done and I am tired, I collapse the scope, cover it, clip on the wheel bar, bring it in and then collapse myself.

David Shouldice