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Teleport

the telescoping telescope

(Don't try this with a 25" Dob on a Vespa)

by Tom Noe

A self contained 10" Dobsonian that rides on a motorcycle and sets up in under a minute?

The Teleport was conceived at the Riverside Telescope Makers Conference in 1991.

By the summer of 1992, it had ridden thousands of miles including Dallas to Springfield, Vermont.

By the winter of 1991, it had been 28 years since my first mirror. The 6" f/8 made during college was placed in a sonotube on an equatorial pipe mount. Eight years later, an 8" F/7 got a hand-laid fiberglass tube and German equatorial mount machined of scrap aluminum from the Texas Instruments dumpster.

The third was to be a 12.5", which seemed huge when I started rough grinding in 1976. Halfway through the #40 grit, it went into a drawer and stayed for 16 years. Somewhere in shop were pieces of the Pacific Instruments equatorial acquired along with the 12.5" blank, tool, and abrasives. The small photo processor manufacturing business I had started had taken all my time for years.

Burned out and needing cheap therapy, I remembered happier days as a "Telescope Nut". Noting that my initials were still T.N., I mounted the tool, retrieved the mirror and resumed grinding.

Some of you know pushing glass and walking around a barrel is a near Zen experience. Nearing age 50, it was more so than it had been with the earlier mirrors. I thought of things I had pushed aside for years and got back in touch with myself, a kind of "cogito, ergo sum". Three months later, I sent off a pretty decent f/6 for coating, found the mounting pieces and started to rebuild it.

The Texas Astronomical Society made me feel welcome back and told me about the Texas Star Party to be in a few months. I decided to finish the 12.5" for it and for the Riverside Telescope Makers Conference the following weekend in the San Bernardino Mountains.

This would let me attend my first star party and first telescope maker's conference both in the same trip. After all, when you cross West Texas from Dallas to Ft. Davis, you're halfway to Big Bear Lake, California.

The TSP was all they told me and more, with equally awesome skies and 'scopes. Having missed the "Dobsonian Revolution", it took time to adjust to seeing portable 25" reflectors. On to California, there were even more great Dobs at the Riverside Conference.

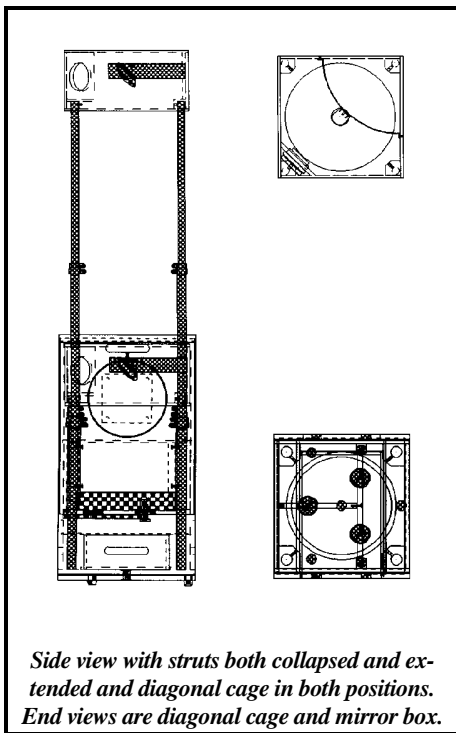
I had meant to pursue ideas for an improved equatorial, but spent my time there ogling those big Dobs. The 12.5" was beginning to seem optically small, mechanically ponderous, and out of date. It weighed 360 lb., filled most of a minivan, and took an hour to set up or take down. The technology had changed while I was gone, and I was way behind.

Sunday morning, the last day, I took a final look around before leaving and saw a conference "old timer" stroll by with a 6" dob on his back. I don't remember the maker's name, but he called the scope "Herbie", and said he always took it for a walk on Sunday mornings.

Herbie was just an open frame with a single strut support. It took some bolting together, but it let the maker walk up a mountain with a 6" telescope on his shoulder! I went to my tent inspired. Could careful design work from a "clean sheet of paper" create a larger Dob that could easily be carried and allow even quicker and simpler set up? Could it incorporate more sophisticated features?

I sat in front of the tent sketching for a half hour before breaking camp. The concept that came out had a diagonal cage nested inside the mirror box, which nested inside the rocker box. Four struts extended to raise the cage for quick set up without tools. The inspiration came from Herbie and the big Dobs, but the design details were to come from 16 years design work in the photo industry.

I was impressed with the rigidity and light weight of the Serrurier trusses, but transporting eight long rods and bolting them in place each time seemed cumbersome. Four struts in a parallelogram would not be as rigid as the triangles in a truss, but should work for a small scope. If I was wrong, I would make eight struts extend into a truss. (still want to try that on a larger scope)



The extending refractors used by ships' captains in the past made the word "telescope" come to refer to the sliding of parts of a system inside one another. This mid-size reflector would thus be a "telescoping telescope". It would be the ultimate in portability for its mirror size, and would be called the "Teleport."

Back home, the first design step was to measure the passenger seat on my Honda Gold Wing GL1500. The second step was to load FastCad and spend a couple of hundred hours at the screen to fit a 10" f/5 in the space available. It took some time to design a backrest that would quickly open into a telescope.

I enjoy the approach Tom Clark describes in "The Modern Dobsonian". Designing on the fly, laying out parts on the materials and cutting is creative and fun. I've prototyped many things that way, but this time it wouldn't work. A minimum size "telescoping" system would demand a detailed design effort.



The partly complete Teleport with the 12.5" and Sport. (He gave it his seat on the bike)

Everything had to be custom. Using standard components would have greatly increased the size, losing much of the benefit. Also, the Teleport had to be more precise than a typical Dob. Clearances would be small, and everything would have to fit well. I knew the alignment of the strut mounting holes would be especially critical.

It might have been possible to design the Teleport without multi-layer CAD, but it probably wouldn't have happened. There would have been so many redesigns and so much scrap I might never have finished it.

After considering familiar materials as well as more exotic ones, I settled on Baltic birch. It's strong, stiff, light, and easy to work. The finish would be a Sherwin Williams chemical coating called Polane 2.8T+, the same as I used on photo processors (even the color.)

The legs of my Bogen 3001 tripod made three good rigid struts, so I bought another and pirated one leg. (Anybody want a good deal on a bipod?)

The 200 hours of design work, spread over three months, paid off in short construction time. When I finally cut material, it only took three weeks of evenings and weekends until first light.



The finished Teleport

The optics were to be standard. (Having taken 17 years to make the 12.5" mirror, it seemed prudent to buy this one.) During the design phase, I ordered a 10" f/5 from Parks. With Naglers and Panoptics, it gives spectacular wide field views that are really great.

The Teleport is its own case. The top is a plate that snaps into grooves in the rocker box sides. A leather strap lets it be carried in one hand when closed.

To make it self contained, an eyepiece drawer was included in the base. This was done without increasing the overall height, though a Nagler and two Panoptics add 5 lb. to the weight.



The built-in eyepiece drawer

The focuser is a design I had thought of years ago, but had never built. It's ultra-low profile (3/4") lets it fit on a 45° corner of the diagonal cage and clear the mirror box. It allows a 1-3/8" diagonal. It's helical, machined of black acetyl. In place of female threads, three machined set screws engage the male eyepiece sleeve threads to eliminate play.

It works well, but acetyl has more thermal expansion than aluminum. The eyepieces are tight in cold weather and loose when it's hot. Three spring loaded ball screws were added to hold the eyepiece and reduced the problem. Adjustment is too fine because the lathe I had would only go to 8 threads per inch. The next one would be 4 TPI.

While I was away from astronomy, Steve Kufeld had developed the Telrad. I put one on the 12.5. but it was too big for

the Teleport so I designed a compact version. The optics are reversed and in a housing made of sheet ABS plastic. It's hinged at the rear in a slot in the diagonal cage. It friction locks open and automatically folds in as the Teleport is closed.

After doodling a simple circuit for the LED light source, I saw a test report on the Rigel Systems PulseGuide. It's for illuminating guiding eyepieces and has variable brightness and pulsing frequency. Modifying my design to use it saved me many hours for a few bucks.



Folding mini-Telrad and focuser

Now I would use one of the new air rifle sights. They are mass-produced, downscaled version of Al Nagler's Starbeam, available with refinements, from several sources. One nice feature is its altazimuth alignment. (An improved Teleport would have 90° collimation for the main mirror. Axes 120° apart are confusing on an altazimuth scope.)

The diagonal support features three screw collimation, turned 90° from the normal orientation. This keeps everything in the diagonal shadow and limits the total axial length to just that of the mirror itself. A single curved vane spider also minimizes axial length.



Spider, diagonal holder, and shroud

A shroud of rip-stop nylon is held by Velcro at the top and bottom. It re-

moves in seconds so you can lift out the mirror for cleaning, and it opens and folds with the scope. PVC rings support it, but the nylon grows when wet, so it sags in heavy dew. (A different material or an elastic section would stop this.)

The Teleport's easy transport and quick setup invite lots of use. I saw more with it the first two months than I had in the previous twenty-five years. (I'm still a lousy observer, but then someone has to build the telescopes)

Its first star party was Okie-Tex in the fall of 1991. Several people stared at the strange backrest on the Gold Wing until someone finally noticed the altitude bearings and said "It's a Dob!" Most guessed a 6" or 8", and were surprised that the small box housed a 10" mirror.

People kept asking me to show the set up, and invariably someone would have a stopwatch. The record is 22 seconds, and 45 is easy. That's 10% of the time for the next fastest 10" I've seen, and about 1% of what it takes for my 12.5" German equatorial.

The Teleport holds collimation within about a Cheshire bullseye, using the following technique to open it: *Lift the diagonal cage with both hands to fully extend the struts. Holding up the top section of each strut, tighten its knobs, always in the same sequence.* I've since had design ideas I believe would make it hold collimation even better.

Long bike trips introduce another variable. The mirror rests on three set screws, and is free to rotate. It does so when crossing rough spots. At first it was scary to hear the mirror bang on the screws at railroad crossings, but I got used to it after a few hundred miles. After a long trip, it takes a half minute to restore the mirror orientation. Otherwise, collimation is off because the mirror front and back are not parallel. An improved cell design idea precludes this.

Our first real bike trip was the 600 miles to the Texas Star Party. Opening it drew crowds, and though it was too late to enter the Teleport, the judges asked me to show it on stage at the awards presentation because it was so different. It seemed well-received and was written up by some of the magazines.

Coming from making photo processors and not knowing much about Dobs had apparently helped me stumble onto something. When I designed my first C-41 processor in 1974, I had never seen one. Unburdened by pre-conceptions, I had lots of mis-conceptions. Such ignorance is often a mixed blessing.

Several people at Okie-Tex and the TSP asked about a commercial version. It was flattering to be offered deposit checks, but I wasn't about to accept. I turned a hobby into a business 17 years ago; no way I would do that again!

In the summer of 1992, I sold the processor manufacturing business with the understanding I would help the new owner six weeks, be gone a month, then help again. I had wanted to take a bike trip to Nova Scotia for twenty years.

The annual Stellafane Telescope Makers Conference would be in Springfield Vermont in August. I had read about it in college in '63 when I built the 6", and always wanted to go. After the pressure of the business, a long bike ride would let me clear my head, tour Nova Scotia, and attend Stellafane to see what the "big boys" thought of the Teleport.

It was a great trip, with many chances to set up the Teleport and view with friends along the way. After Nova Scotia, I crossed Maine, New Hampshire, and southern Vermont in heavy rain. For a while, it seemed I might come 6,000 miles with the Teleport behind me then drop it and the Wing in the mud in the last hundred yards, but no. Both it and my travel guitar were wrapped in space blankets behind me when we rode in, and all three of us were dry.

Many people seemed surprised to see a 10" telescope on a motorcycle with Texas plates in Vermont. I told them that Dallas to Springfield isn't really such a long trip, if you know about the short cut through Nova Scotia.

Entering the Teleport for judging the next day and setting up on famous Breezy Hill gave me a special feeling. I expected to be there an hour or two, but we had to stay all day. I must have opened and closed the Teleport a hundred times. My feet were blistered from standing on the side of Breezy hill all day in motorcycle boots.



Close-in bike parking on Breezy Hill

Exhausted, I limped on blistered feet with the 50 lb. Teleport the half mile back to my tent, but I was smiling. The judges had been non-committal, but I thought they liked it. The Teleport had already gotten an award plaque from the NASA Goddard Astronomy club.

Next day after the swap meet, about 2000 of us gathered for the awards. It was a thrill to hear my name called, and I didn't mind making three long trips from way up in back. Of twelve awards in four categories, the Teleport got first in innovation, second in mechanical design, and third in craftsmanship.



Leaving Stellafane on cloud 9

At noon Sunday, I left for the Experimental Aircraft Association fly-in at Oshkosh, Wisconsin. I was so elated, the Gold Wing felt it was flying like one of the homebuilt aircraft that would be there. Before boarding the ferry crossing Lake Michigan Monday night, I bought some cheap sandals so my blistered feet get some air during the two days I would be walking around at the fly-in.

Arriving at home two weeks later, it all seemed like a dream, but my mailbox held a reminder that it was real. A thoughtful couple who had been at Stellafane sent me an article from a Vermont newspaper, all about the Teleport coming from Texas on the bike and being so compact and different.



Combining trips just seems to be required. The Riverside Telescope Makers Conference in the spring would let me return the Teleport to its place of conception after it had traveled coast to coast. The Folk Festival in Kerrville, TX would start as the Riverside Conference ended, so I would make both in one trip.

There wasn't time to return to Dallas in between, and I had to take two guitars and some other gear for Kerrville. Even a Gold Wing has a limit, so I drove my Nissan NX 2000. I was surprised at how much I enjoyed my first car trip in years. Hiking Anasazi ruins and seeing wonders of the West missed on prior trips was great. I didn't yet know Riverside was to be a much less pleasant experience than Stellafane had been a year before.

At Big Bear Lake, the Teleport was duly entered and tagged. The people seemed to really like it, and it was a thrill when John Dobson came by and give it a close look. He said he liked it, and expressed concern only about the temperature effects of the black shroud. I told him people were asking if I planned to build them commercially and that if I ever did, I'd like to give him one to use on the sidewalks in San Francisco.



John Dobson checks it out

By now, I had answered questions about a commercial version enough to have a fair idea of what it would take to do it. Just as I was answering one about cost the judges walked up and thought it meant I was taking orders. I told them not so, but that enough people had asked to make me think about it.

They looked the Teleport over and read me the riot act about bringing a commercial design to Riverside. I assured them that this was my first design, made strictly for fun. I explained that it looked commercial because I had design experience and access to tools and techniques not usually in one's garage. They shook their heads and flatly disqualified it. They were not to be persuaded otherwise by my protest at the conference, or by the three letters I wrote them later.

I've learned there has been a history of problems at RTMC with award winning ideas that then became commercial products. It seemed the judges wanted to be sure and avoid a repeat of this. If an occasional good amateur idea is disqualified in the process, well, that's just the price we must pay . . .

I had never seen the rules the committee said disqualified me, and I had trouble getting a copy. They answered my first two protest letters, but ignored both requests (with SASE's) for copies of the rules. I finally got one by using a friend's name and address. Clearly, these rules do not disqualify the Teleport. Nothing before or since RTMC '93 made it a commercial telescope.

I was confused. Were the awards committee members just "gun shy", or was there some "NIH" syndrome? Did these California boys think they had an exclusive on good ideas? Were they miffed that the Teleport had been to Stellafane first? Was I penalized for design experience in another field? What was it?

If I had been a designer for Meade, Celestron, or Parks or had previously built or sold telescopes, I wouldn't have entered. I know the difference between an amateur and a pro. To disqualify my very first design, when I stated in person and in writing that I didn't design it as a commercial product, seems absurd. This attitude prevents sharing the ideas such conferences are all about. Many amateur ideas find their way into the commercial world and improve it for all of us. Is that wrong? Do we want to discourage it?

Sorry for the time on the soapbox, and now I'll climb off. It's been almost four years, and my "commercial telescope" sits in the living room corner. It goes to the club's observing site now and then, but more often shows non-astronomers the skies here and at the Kerrville Folk Festival.

In August of 1994 I returned from a bike trip to Alaska to get the remnants of my processor business back in a default the next day. Being the only source for parts and service for the several hundred machines in the field hasn't left much time for telescopes. Still, I've learned a lot from the Teleport and thought of a bunch of improvements I want to make. I'd like to build an 8" version some day, and even try the concept on a 12.5".

In the past two years, I built a small building beside my house for the film processor business. I'm hoping to get current with that in the next few months, and then play with an improved 8" version of the Teleport in the next year or so. Wouldn't it be a hoot if someday I got to devote the time needed to develop a commercial version? Would the awards committee say "See, we told you so. Our crystal ball was right all along"?

It seems to me such clairvoyance should earn them credit for the first ad:

TELEPORT
The telescope that was the leading award winner at Stellafane '92 and judged too good for Riverside '93

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