Copyright (c) 2004 Cloudy Nights Telescope Reviews

www.cloudynights.com

The Story of The CapeNEWISE

200mm f/6 Catadioptric Newtonian Telescope
Prototype Product Review
by David Knisely [click to email author]

Available from [Cape Instruments]
Telescope House
63 Featherston Drive
Burbage Leicestershire LE 10 2PW UK
Suggested retail price: 1600 British pounds (optical tube assembly ONLY).

There have been a number of variations of the Newtonian over the years with most being attempts to deal with the problems of Coma and, to a lesser extent, field curvature. Designs like Maksutov-Newtonians, Schmidt-Newtonians, and Coma-corrector-equipped standard Newtonians have all made their mark in amateur circles. Rumors had been circulating that a new and much more compact design was about to make its debut: the Cape Instruments Newise 8 inch f/6 Catadioptric Newtonian. It is being marketed in England to some rather positive reviews, so it gained my interest. I managed to get a couple of advanced prototype optical tube assemblies from the designer Peter Wise, and the following is the story of what happens when a radically-new telescope design is put to the test by the harsh shipping conditions of trans-atlantic flight and by the exposure to the average amateur astronomer.

INSTRUMENT DESCRIPTION

The CapeNewise instrument is a 200mm (8 inch) f/6 (1,200mm focal length) telescope in a Newtonian-style configuration. However, this telescope is anything but a typical Newtonian! The primary mirror is *spherical* and of a *very* short f/ratio (f/3), which makes the entire instrument rather compact. This fast spherical mirror would be a big problem if it weren't for the set of internal optics used in the telescope to both correct the extreme spherical aberration of the primary as well as lengthening the effective focal length to something a little more reasonable. This is what changes the instrument from a straight reflector to a Catadioptric design. The first lens in the catadioptric system is a negative doublet "transfer lens" sitting just ahead of the flat secondary mirror, while the second lens is a positive doublet or "imaging lens" which sits inside the base of the focuser. The secondary obstruction is about 25% and the secondary mirror assembly is mounted in a full-aperture coated flat optical window at the front end of the tube. This window prevents the appearance of diffraction spikes from a secondary spider, and makes the instrument look a bit like a short Schmidt-Newtonian, even though it has little in common with one. The telescope is designed to yield a flat field of view which is supposed to be diffraction-limited over a full degree on the sky. As such, it is intended to serve those doing moderate-field imaging, as well as working for visual use.

The telescope is only 62 cm (24.4 inches) in length, 25.4 cm (10 inches) in width, and has a weight of 9.5 kg (20.24 lbs). While only about half as long as a typical 8 inch f/6 Newtonian, it is about as heavy or slightly heavier than one. The secondary assembly holding the secondary and the negative transfer doublet lens is a short black tube open at the far end, and with a large oval opening along one side. This assembly contains both the secondary mirror as well as one of the two sets of lenses used in extending the focal length and correcting for the primary's spherical aberration. It also contains four allen adjustment screws for positioning and tilting the secondary mirror during factory collimation (normally, these screws are under a metal cover). The secondary assembly is permanently mounted in the center of the optical window, and the optical window is permanently fixed in a forward housing attached to the front of the telescope's tube. The focuser is a rather tall Crayford type with a height ranging from 14 cm to 18 cm (5.5 to 7 inches) above the surface of the tube and contains a threaded 1.25" adapter with a 2" adapter available as an accessory. The positive imaging lens used in the optical correction is located inside the base of the focuser, and the focuser tube base is actually slotted to allow it to pass around the second lens for a short distance during focusing. Focusing was fairly smooth but there was a small amount of noise and even a little play when the knurled focusing knobs were turned.

The telescope tube itself is made of thin-wall steel, which would be partly the source of trouble later on. The outside of the tube is painted in a nice "ripple" powder-coat white paint, and the end housings are both black. The interior was painted flat-black, and the secondary assembly appeared to have been black anodized. The tube also has a slot-base for a dove-tail-like finderscope stalk mount similar to those sold by Orion and Celestron. However, the instrument does *not* come with a finder. The front and back ends of the tube have black aluminum end housings for the optical window and the primary mirror cell, and both ends of the instrument are sealed (although some air can enter via gaps in the focuser housing). The primary mirror tilt can be adjusted by three allen screws located on the back end of the instrument. The forward housing for the optical window has a rather narrow ledge where a dewcap might be mounted, but none is provided. The telescope does *not* come with a mount, but it does come with a pair of nice aluminum rings which can be mounted on a variety of dove-tail or other mounting schemes for standard German equatorial mounts. They are hinged to allow them to be opened for telescope removal when the rings are attached to a mount, and when loosened slightly, they allowed the telescope to be rotated without it sliding downward too far. I mounted these rings on the dove-tail of my Orion (U.S.) SkyView Pro mount, but had to add a lot of extra counterweighting to get things close to balancing. This mount is barely adequate for this heavy an instrument, so perhaps a heavier-duty one like the Orion Atlas would serve better here.

THE NEWISE EXPERIENCE (and the Newise Frustration!)

I received the first CapeNewise 8 inch just before Christmas, but this "present" soon turned into a headache. The instrument arrived in a very big armored shipping case that looked like it came from the "battleship" school of design (it probably cost 1/10th of the telescope's retail price). Once opened up, the telescope sat there cradled in a lot of hard foam with its end rings and a camera adapter. I had just finished helping a friend construct his own "short" 8 inch f/5 Newtonian in my basement workshop, but it still surprised me as to how darn short this thing really was! One of the nice things I noticed was the simple hard but flexible dust cover, which could be dropped and even stepped-on and still remain quite usable (try that with your metal SCT covers sometime!). The instrument looked solid, but one glance into the focuser revealed an immediate problem. The secondary mirror was rotated wildly out of alignment (about 20 degrees off). Although the case showed no obvious signs of damage, it was clear that it had been bounced around more than a little to yield this degree of rotation. This would not be a huge problem for a standard Newtonian, as a quick rotation of the secondary assembly could put things right. However, the secondary assembly for the Newise is bonded to the optical window, making any idea of easy rotation questionable to say the least. I did notice the front end had a retaining ring with spanner holes, so I was able to release the ring enough to grab onto the front of the secondary assembly and gently rotate the entire window around to where I could finally see some light coming from the secondary mirror. I noted that the opening in the side of the secondary level was letting in light from the environment which then went through the front transfer lens, bounced off the primary, and was visible in the focuser. However, in low-light situations, the contribution to scattered light from it was minor. I let Peter Wise know about the rotation problem by e-mail, but we both thought that once rotated into the correct position, all would be well. Nothing could be further from the truth!

The weather was quite cold that week, so the first thing I found out about the telescope was that it takes a *long* time to come to temperature, probably as long as a standard Schmidt-Cassegrain would. Once cooled down and on the mount, it was time to take a look. I put one of my old finders from my Celestron "Short-tube" refractor on the scope and went to work. My first glance into the eyepiece was a real heartache. Even at 50x, stars showed clear signs of major astigmatism mixed in with some kind of odd distortion that prevented even halfway decent star images from forming anywhere in the field of view. Stars were also showing a little lateral color and faint bluish halos. Jupiter was so distorted that could only see the two major equatorial belts, and the Cassini Division in Saturn's rings was nowhere to be found! The scope "looked" collimated form the sight-tube and peep-hole, but it clearly wasn't even close. Tweaking the primary adjustment had only a little effect on the quality of the star images, so it was back onto the computer to e-mail Peter in England for instructions. He indicated that the secondary mirror was probably still out of alignment, so he gave me a few details and I went to work.

The next three weeks were one complete exercise in *extreme* frustration. The alignment of the secondary mirror turned out to be anything but straight forward. The cover for the adjustment allen screws is mounted so close to the surface of the optical window that it was hard to get it off without touching the window itself and leaving fingerprints. This "closeness" of the window to the front of the tube also was a problem when using the scope outside, as I would invariably grab the front end of the instrument to move it and end up nearly touching the window each time unless I was very careful. Once the secondary cover was removed, the three tilt adjustment screws and the central "grub" screw (used for lateral positioning of the secondary) were visible and easily accessible. However, the actions of these screws was anything but intuitive. They would interact strongly with each other, allowing you to move the secondary, but not quite in the direction you wanted. You would turn one and start to see the secondary move in the right direction, only to run out of "tightness", forcing you to go to another screw which would often make things vastly worse. I ended up chasing the alignment around and around for hour after hour with little gain. The primary mirror was not center-dotted, so it was difficult to see when the secondary was close to alignment (I eventually used a laser pointer to manually "center-dot" the mirror). Several times, I would reach a point where everything looked to be in perfect alignment with the sight tube and Cheshire eyepiece, but I would later take the scope out to try it and find out that little had changed in the appearance of the star images. Peter sent me some instructions about using the central "grub" screw to move the secondary up and down the housing slightly, but this gave little if any improvement in the final image. I have collimated Newtonians, SCTs, and even an old Cave Cassegrain, but this Newise 8 inch was simply not going to let me have my way. After weeks of fruitless attempts, I came to the inescapable conclusion that this telescope simply was *not* user collimatable!

I composed an e-mail to Peter Wise telling him the sad story and giving him my opinions about the telescope and what might be done to correct the problems. I also told him that as far as I was concerned, further efforts on my end would be a waste of time, and I would be sending the instrument back without publishing a review of it. He asked about perhaps sending me another one after some modifications were made, and I agreed. Several months later, a *second* Newise 8 inch showed up at my door. This time, the optical window was firmly glued in place, which was the only major modification I could see. The instrument again "looked" to be perfectly collimated, but once again, things were not as they seemed. I got the scope mounted back on the SkyView Pro and got it out under the cool Nebraska skies again. This time, I could see a number of belts on Jupiter and the moons were more point-like, so things had improved noticeably. However, high-power star tests still showed obvious signs of astigmatism along with a little of the same weirdly-distorted star images which refused to show diffraction structure. The intra and extra-focal images were noticeably different, looking almost triangular inside, and oval with a "cut" out of one side on the other side of focus. "Best" focus showed a star image with 2 to 3 odd flarings (even the moons of Jupiter showed these at 120x). The astigmatism gave a softness to high-power images of the planets, so it was bad enough to still be considered unacceptable. What was worse, the second instrument would not allow my 30mm WideScan III or my 5-8mm Speers Waler eyepiece to come to focus. I sent another e-mail to Peter and he gave me a few more secondary collimation instructions, but even with my new Digitec artificial star to help out, I was unable to significantly improve the star images and frustration started to set in once again. Finally, Peter said the unthinkable: HE WAS COMING OVER HERE!! He would be arriving in April in Lincoln with yet *another* 8 inch to see for himself what was going on.

I met Peter for the first time at the Villager Hotel in the middle of Lincoln, Nebraska, and we had a grand time talking about telescopes and our local "week" of Astronomy-related activities culminating in Astronomy Day (which he would be staying around for). He is one of the nicest people you are likely to meet in the telescope industry and revealed that some of his sales people wanted him to call the scope the SNARL (Spherical Newtonian And Relay Lens), so they could say "Does your CAT SNARL?". We finally got his "new" instrument back out (I had the #2 instrument in my van) and we put it on the mount. We didn't have a lot to look at in the parking lot, but we did get a few spectacular reflections off a nearby sign. Things weren't looking too bad until we kicked up the power a little. We picked out Venus and could see a little cloud detail, but other than this, it was a somewhat frustrating experience for him as well as me. To Peter's surprise, the astigmatism was back again, this time in the #3 instrument he had just brought over here! I managed to set up the Digitec artificial star about 150 feet away and Peter got out the allen wrenches and went to work. We worked and worked in that parking lot until after sundown, and then did star testing on Polaris and Jupiter, but again, the astigmatism remained. We got a lot of odd looks and some questions from other guests at the hotel, but we didn't get much closer to a solution to the problem. Just before midnight, we gave up and went to dinner and I eventually drove home to get some sleep.

About 5 a.m. the next morning, Peter says that he woke up and suddenly thought he had the solution. The front assembly holding the optical window is aligned and then glued into place, as are the secondary and primary mirrors. However, unlike the other optics which are glued using silicone glue, the front assembly was glued with Epoxy. All three telescopes were shipped in unpressurized cargo holds of aircraft where temperatures can get as low as 35 degrees below zero F. The Epoxy gets rather brittle at those temperatures. When the telescope started to warm up, the aluminum end and the steel telescope tube expanded at different rates, breaking the seal and allowing the nose assembly to pull the entire optical window and secondary assembly out of collimation. The alignment of the various optical components of the telescope is *extremely* critical, so even a very slight movement might be enough to make the instrument uncollimatable, especially with the ability to change the tilt of *only* the secondary mirror and not the alignment of the transfer lens. He later went to a local hardware store to make a wooden jig and get a small hammer to test this idea by gently tapping the front end in various places to see if he could put some positional correction into the nose of the scope.

BACK OUT UNDER THE STARS...

We had our club star party south of Lincoln that night, so it gave Peter a chance to test out his "brute force" alignment technique. This time, things seemed to be performing better. After some additional tweaking, Titan looked more like a dot than a spiky blob, and the scope gave me a chance to assess its performance. The first thing I noted was that the field of view was indeed *very* flat. Peter only had his

18mm Plossl with him and was trying to show me how good the field was, but the eyepiece wasn't quite up to the task. I decided to show Peter a "real" wide-field eyepiece, so I put in Meade's 14mm Ultrawide with its 83 degree apparent field. I put the scope on M44 for a rich starfield, and in Peter's Newise 8 inch, the 14mm Ultrawide produced a nearly one degree field at 86x. Peter looked in and was amazed at the view (he said he now really wanted a 14 Ultrawide) . The star images were very nearly pinpoints all across the field of view with no signs of coma or field curvature. However, high power still showed some astigmatism, although it was not quite as bad as it had been in our earlier test.

A week later after Peter had gone back to England, I continued my testing and attempts at tweaking the alignment. This third instrument now allowed me to use all of my eyepieces, as they all reached focus nicely. There was a small amount of shift in the focuser, so the "zero image shift" claim in the Cape Newise flier wasn't exactly accurate. However, with the 30mm WideScan III eyepiece, I managed to get a nice 2 degree field of view, although the outer portions were not fully illuminated. Images were better than in the #2 instrument which was returning to England, but sadly, even this one wasn't quite as good as it needed to be. Try as I might, I still could not completely eliminate the remaining astigmatism present when I made additional collimation attempts. At powers around 130x the astigmatism was becoming obvious, and at powers over 170x, it began to have a significant impact on high power images. The markings on Jupiter took on a mild softness with an apparent lack of an ability to achieve a sharp focus, and the moons showed the typical astigmatic elongation with focus change. The view of the moon was nice with some sharpness, but pushing the power into moderate and high ranges even during excellent seeing made the image something less than the crisp view I could get in my 8 inch f/7 home-built Newtonian. With this kind of performance, the telescope I had in front of me would not make a planetary observer very happy, especially considering the telescope's high price.

CONCLUSIONS:

The Newise 8 inch f/6 Catadioptric Newtonian is an interesting idea, but it is clearly *not* a mature and fully-debugged design. The apparent shipping decollimation of *three* successive instruments and the lack of easy and successful optical realignment by the user amounts to a significant design flaw which needs to be remedied before this instrument is produced in major quantities. From communication with designer Peter Wise, some modifications are in the works, primarily in the form of an aluminum tube with the end machined so that the optical window assembly cannot shift. Whether this will correct the problem is unknown. I am not ready to write-off the Newise telescope just yet, as even Celestron had some severe collimation difficulties with their very first production Schmidt-Cassegrains. However, some of the statements made on the Newise web page and in their fliers need to be less excessive, as they are clearly not backed up by what I have seen so far. The instrument may "travel well" in the U.K., but it does not "ship well" over several thousand miles. Perhaps those who can purchase and use the telescope in Europe without having to fly it around might get some use out of one, but for those in the rest of the world, it would be best to wait until further refinements are made and the company can demonstrate that the final production instruments can survive shipping with little or no need for user collimation, as well as providing performance worthy of this instrument's cost.

Editors Note

The mark of a good company is not that they do not make mistakes, it's what they do once they find the mistakes. In the case of the folks at Cape Instruments, they did everything in their power to figure out what the problem with collimation was. Now that they know the problem, they are addressing it immediately. A note from the owner is below. Well done Cape Instruments.

A note from Peter Wise at Cape Instruments

We are changing from a welded steel tube that cannot be trued at the ends (because they are not round enough), to a drawn aluminium (seamless) tube that will be accurately trued at both ends. This is so that the troublesome front ring containing the window and central optics can be located surely and squarely. A further bonus is that we will not need to use adhesive, allowing for user maintenance, as well as being 4 lbs lighter. These tubes are due to arrive next month.

Discuss this in the Forums