Astro-Physics 10-inch Maksutov-Cassegrain Report

Jay Reynolds Freeman, freeman@netcom.com

On December 11, 2000, I received a new Astro-Physics 10-inch Maksutov-Cassegrain telescope. I hope a report will be of interest.

People who know me may wonder if I had any reason to buy one other than wanting to gloat. Am I not the deep-sky weasel who keeps making comments like "aperture wins"? Yes, but there are other considerations.

First, our hobby comprises many sub-hobbies, and most of us practice several. I do much deep-sky work, yet when I do look at solar-system objects, I want to do it well. Astro-Physics's offerings are on most people's short list of candidates for this kind of observing.

Second, there are non-solar-system objects for which high resolution is important. They include double stars and certain planetary nebulae.

Third, where I observe, Harvey, my big white Celestron 14, is hard hit by seeing. I have set it up some 100 times in the last three years, but only twice in first-rate seeing. Smaller telescopes at the same places are less bothered: Six- and seven-inch refractors deliver most of their performance often. I hoped that 10-inch aperture would give more resolution, obtainable often enough to be useful.

Fourth, Astro-Physics has been working on the cool-down problems that often restrict large telescope performance. These problems have previously jaundiced my opinion of large Maksutovs.

Fifth, though the 10-inch Maksutov optical tube assembly (OTA) weighs more than the OTA of the 6-inch f/8 Astro-Physics refractor I bought for planetary work, I expected the smaller length of the 10-inch would make it simpler to set up. It might well be not only better for the things I use the 6-inch for, but also easier to use.

Sixth, I expected the 10-inch Maksutov to work well with the rest of my stuff. It is smaller and lighter than my C-14, so I knew it would fit in my car, and I planned to use it on the same Losmandy G-11 that carries Harvey.

THE PURCHASE PROCESS:

The 10-inch was my first telescope bought direct from Astro-Physics, and I had no idea what to expect of the buying process. It was lengthy and a bit complicated.

I learned of the 10-inch project in mid 1998, via usenet newsgroup sci.astro.amateur. I wrote to Astro-Physics that November, to ask about buying one. Proprietor Roland Christen responded. There was a list of interested persons, and he would put me on it. A chance to order might follow in six months. No money changed hands then, for it was not sure Astro-Physics would produce the product, or at what price.

It took a lot longer. Now and then I sent email asking what was what. Someone always replied promptly. Twice I took long vacations, and advised Astro-Physics that if a chance to buy came up while I was away, that I still wanted one. I didn't save the responses, but their general flavor was "thanks for telling us, not to worry."

The chance to order came in January, 2000, a year and two months after I had put my name on the list. The emailed announcement arrived on Friday, after I had left town for a weekend. I didn't get it till Sunday, but the window to order lasted till Tuesday, so no problem. The email advised that the first unit should ship in two or three months, and that others would follow. The price was $9800 for a bare OTA, with a down payment of 50 percent. Bits and pieces, like tube rings and finder brackets, would have to be added to the order, later on.

I ordered happily, even though $9800 is more than the cost of any three or four other OTAs I have owned. For perspective, I could put the 10-inch Maksutov and those three or four other OTAs in the Isuzu minivan I bought as a telescope transporter, and the van would still have cost more than its contents. Nobody with a late-model car should consider amateur astronomy expensive.

It was nearly a year till anything shipped. I sent occasional email to make sure I had not missed something, and monitored sci.astro.amateur and the Astro-Physics users' group for news. Roland was having problems -- subcontracted optics had to be re-worked, stuff came back from coating with damage or poorly done, and so on. I didn't worry, since many friends had dealt with Astro-Physics, and said the company dealt with their customers fairly. In fact, I was glad I had a firm order on the books: The problems Roland reported are things that drive up cost. I suspect I would have paid lots more if the price had not been set till delivery time, or if I had waited for a later production run.

Astro-Physics shipped via United Parcel Service ground. Despite the Christmas rush, everything made it to me quickly.

MECHANICAL DETAILS AND FITTING OUT:

The OTA carton was a bit larger than three feet long by a foot and a

half square. Fitted inside was a pale gray steamer-trunk style carrying case, with stout handles and four latches. The OTA lay within, wrapped in plastic film, protected by several inches of foam.

It was gorgeous, with glistening white paint, snug seams, and handsome styling. There is always a problem getting something heavy out of a tight case, but Astro-Physics had left a couple of nylon straps, like backpack webbing, wrapped around the tube, to pull it free. I pulled, and was delighted how much lighter it was than my Celestron 14: I haven't weighed it, but I see no reason to doubt the specification of 33 pounds. I removed the plastic and slipped off the sturdy metal dust cap. The optics were intact, though I had to look hard to see that the corrector was installed, the low-reflection coatings were so good.

The bottom of the tube had hardware to mount on my Losmandy G-11. Astro-Physics made special adapter blocks to fit a stock Losmandy dovetail plate to the OTA, and all were in place. Two brackets for detachable finders were installed at the 10:30 and 1:30 positions on the aft end of the tube. Wherever you put one finder, it is in the wrong place much of the time. Having two helps a lot.

Two more packages included the rest of the OTA order and some other stuff. There were three more items in the main order; namely, the rather short dewcap, an interchangeable secondary obstruction which is larger than the aluminized secondary surface, to baffle wider fields, and a few printed pages of hints about the instrument's features. The dewcap does not reverse for stowing on the OTA, as with some other Astro-Physics products -- it would collide with the fittings that attach the stubby tube to the mounting. The extra items included a spare pair of dovetail adapter blocks, for the top of the tube, a MaxBright diagonal, and the "ring" portions of the two finder brackets, which detach from the tube to allow the instrument to fit into its case.

I had forgotten to order one item -- the OTA does not come with a power cord for its ventilation fans. It turns out to be the same one used with Astro-Physics mounts. The company was giving people the opportunity not to pay for two of them, but I don't have an Astro-Physics mount, and hadn't realized I needed a special cord.

When I hefted an adapter block, I was pleased by how light it was. It was cut out and contoured to remove metal and save weight. Many such parts are made by die-casting or sand-casting, but the Astro-Physics units are milled.

I had plans for the extra blocks. One worry with sleek, shiny OTAs is dropping them. The owner of an Astro-Physics 155 mm EDFS told me

that when he lifts it, he fears doing a watermelon-seed number, in which the tube squirts out of his hands and crashes to the hard ground, scattering shards of broken optical glass in all directions. I planned to use the upper adapter blocks as a place for handles, but I didn't know exactly how till I had the blocks in hand. Shiny brass handles, like door pulls, would be neat, or perhaps folding leather ones, like on fine luggage, but the blocks weren't quite big enough, and protrusions might damage the foam in the OTA case.

I ended up tying short loops of 1/4-inch polyester line under the adapter blocks, where there is about 3/8-inch clearance. Each block has two loops -- one each under the left and right side -- paired like the handles on a shopping bag, so one hand at each block can grip both of its loops. I used the double handle arrangement for redundancy -- if one line breaks, that end of the telescope will still be supported by the other. The loops are small -- there is only an inch or two of clearance for my fingers. The part of the loop between block and OTA passes through a length of 5/16-inch diameter clear vinyl tubing, to keep the line from chafing on the corners of the adapter blocks. With the handles installed, my level of nervousness when moving the slick, fragile, expensive OTA declined considerably.

The OTA has lots of interesting technology. Much of my description of it draws from the Astro-Physics web site, or from various postings by Roland Christen, but I am responsible for any errors.

The optical configuration is a 10-inch Maksutov-Cassegrain, with the secondary an aluminized spot on the inner corrector surface. The design has an elliptical primary and is coma-free. It is insensitive to correction change with displacement of the mirror along the optical axis, which is good, because that's how you focus. The focal ratio is 14.6 with the mirror at nominal position.

The primary is quartz. The corrector is BK-7. Roland Christen has tried different ways to reduce the time for a large telescope to come to thermal equilibrium, and considers a quartz primary a vital part of the solution Astro-Physics offers. He has stated that lack of equilibrium affects the telescope not only by distorting optical surfaces, but also by the warm optical components heating air in the tube. Thus choice of optical material requires a trade-off between coefficient of thermal expansion, heat capacity, and heat conductivity: The optical surface must not only deform minimally when out of equilibrium, but also cool down quickly, so tube currents and related effects soon diminish.

The back of the primary is tapered, so the mirror is thinner at edge than at center. It slides on a central tube for focusing, using a

mechanism concentric with the mirror, connected to the focus knob by a flexible belt. In contrast, in my Celestron 14, the focuser pushes and pulls on the mirror cell part way out to the edge. The belt design is much less susceptible to mirror shift when focusing.

Mechanical means for cooling the OTA mix plain and fancy. One simple trick is a removable dust cap at the back of the tube. With it off, plenty of structure protects the primary -- there's not much worry about whacking the quartz -- but most of the mirror back is exposed to air circulation. Two muffin fans are placed to force air across the mirror back. Fans, switch, and 12V power connector are hidden when the rear dust cap is in place. The gap between the outer periphery of the mirror and the inner surface of the tube is pretty well sealed -- it doesn't look like there is a way for dust to get inside the OTA, other than by going up the baffle tube itself.

A big threaded boss protrudes from the back of the OTA, through the rear dust cap. A reducing fitting provides a 2.00-inch focus tube, and a 2.00-inch to 1.25-inch bushing came with it. It looked as if the boss can accept other accessories, but I don't know what they are.

The secondary spot diameter is 2.3 inches, proportionately much smaller than the obstructions in most commercial Schmidt-Cassegrains. Such a small spot should noticeably improve the telescope's performance when viewing low-contrast fine detail.

Small obstruction means poor baffling: Sky light sneaks past the secondary, down the baffle tube, to the field. The aluminized spot baffles a half-inch field, and a removable, larger disc attaches to the center of the corrector to baffle a larger area. Wide fields are useful only at low magnifications, or for imaging, in which cases the contrast improvement for fine detail is undetectable. Thus the larger baffle will not hurt when the telescope is so used.

The rest of the baffling looks conventional. OTA and dewcap have a black matte interior finish that is very dark, even at grazing incidence. The sky end of the dewcap rolls inward slightly -- the width at that end is narrower -- which no doubt cuts down on grazing incidence reflections in the whole system. The OTA is two inches larger than the clear aperture, so shielding of tube walls by the periphery of the corrector cell likely has a similar effect. The central baffle tube, that protrudes through the primary, seems to have the same black matte finish inside and out, and has many fine slits in it, which are supposed to aid in reducing the hot-air plume off the baffle tube.

FIRST LIGHT:

Saturday, 16 December, 2000, was promising, so I took the telescope to Henry Coe State Park, about fifty miles from my home. The case fit sidewise in my van, and made it to the site without shucking around. I arrived while the Sun was up: I had foregone an opportunity to use the telescope the night before, so that my first set-up would be when I could see what I was doing.

I put three 21-pound counterweights on my G-11. I suspected I only needed two, but did not wish to shown wrong by having the OTA do a vertical reverse from being out of balance.

The key part of setup was lifting the OTA shoulder-high and guiding it into the equatorial head dovetail clamp. I have made modifications to my C-14 to help with that process. Would the AP-10 require any?

I set the latitude adjustment as low as I could without the counterweights hitting the tripod. With the dovetail clamp parallel to the polar axis, I would be sliding the dovetail plate up a 20 degree slope as I installed the OTA from the south. I could have gotten a shallower slope with the clamp pointed east / west, but at the expense of the polar axis possibly rotating at an awkward time.

I cleared a spot on the floor of the van in case I needed to set the OTA down, made sure the safety screw on the north end of the plate was out, then lifted the OTA by my new rope handles and carried it to the G-11. Installation was easy. I was much relieved as I tightened the dovetail clamp and put in the safety screw. This telescope will not require special hardware for me to set it up. (Your mileage may vary -- I do push-ups.) Then I elevated the polar axis to the latitude.

I removed the rear dust cover temporarily, to let other people inspect the cell and focusing mechanism, then installed my new MaxBrite star diagonal, finder, and dew cap. Relative humidity was in the mid 40 percents and temperature was 15 C, but I wrapped an anti-dew heater around the dew cap, just in case.

The front dust cap and the dewcap were snug, even with the latter's setscrew backed way out -- I had to tug to get them off. Too tight is better than too loose, but I have often wished for a reasonable way to make the tightness of such items adjustable.

The telescope indeed took only two 21-pound counterweights, so the weight on the mount was some 35 pounds less than for my C-14. The OTA balanced much further forward than a Schmidt-Cassegrain, about half way from primary to corrector. Thus variation in eyepiece height as the

telescope looks at different parts of the sky is greater than for my C-14. With the telescoping legs on the Losmandy extended, the eyepiece was convenient for most of the sky, but I had to scoot low in my observer's chair to view the zenith, and using the finder then required much pretzeling of my spine. Perhaps I should put another finder on the front end of the tube, just for such circumstances.

The telescope had sat in the cool car most of the day, and it did not seem likely that the temperature was going to drop much, so I felt no need to use the muffin fans to cool the mirror, or even to leave the rear dust cap off.

I aligned my finder on a distant tree. The Maksutov's optics certainly worked, the belt-drive focuser felt smooth and solid, with no backlash, and there was no image shift while focusing. Images were good across the field -- indeed, I did not notice any off-axis aberrations of any kind the whole night long.

First celestial light was a view of Jupiter at 309x (12 mm Brandon). I spotted the giant planet while the sky was blue, and turned to it immediately, hoping for good seeing at dusk. No luck, the image was turbulent. I could see several scalloped belts, but little detail. Other telescopes confirmed the problem with seeing. Saturn was also poor. I looked at Venus, whose half illuminated disc was spectacularly brilliant, utterly color free, and seemed to show a hint of shading variation across its surface, then gave up on planets for a while.

I tried a few stars. There was no trace of an in-focus Airy disc, just swirling glare, but I could see enough out of focus to verify that collimation was okay, and what is more, what I could see looked the same inside and outside focus -- scarcely a critical measure of quality with so much turbulence, but encouraging nonetheless.

I switched to a Vixen Lanthanum 8-24 mm zoom eyepiece to hunt bright deep-sky stuff. I logged over 70 objects that evening, so I will only give highlights here. As I began, it still wasn't quite dark, and I had the fun of looking at the Ring Nebula at 155x against a sky background that was distinctly pale blue. It was its usual oval shape, softer at the points of the oval than elsewhere. I could not detect the slightly ruddy periphery that I have occasionally seen with my C-14, even later, when the sky was dark. I ran magnification up with the zoom -- if the seeing had steadied I would have put in a better eyepiece and tried for the central star -- but no such luck.

For the next few hours, I chased sucker holes or peered through thin cloud at deep-sky objects, mostly using the zoom eyepiece at 155x (24 mm

focal length), but occasionally with more magnification. M15 was notably higher than the gas giants had been at sunset, and at 464x -- 8 mm on the zoom eyepiece -- it resolved almost all the way across, with only a tight core that was merely granular. M2 was similar, though not as well resolved, perhaps because it was nearer the horizon.

h and chi Persei were pretty examples of open clusters, both blown more than wide open, showing numerous colored stars. The Auriga Messier open clusters were wide open and looked very different from one another. M35 plus its smaller neighbors, NGC 2158 and IC 2157, provided an interesting contrast in size and compactness of open clusters.

Central Orion has plenty of telescope tests. I looked at M42 and M43 several times, both with the zoom eyepiece and with my 40 mm Vernonscope Erfle, which gave 93x. M42 showed a pale green core around the Trapezium, shading into dark reddish-purple in the "wings" of the nebula. It had less texture than I have seen with better seeing, and a glance at the Trapezium showed why -- with Orion not far above the horizon, the seeing was poor, and the edges of the images of its brightest four stars touched. The seeing was better occasionally, but even knowing where to look, I could not see stars E and F.

Late autumn sky has some bright galaxies. I had an unremarkable view of M74 and M77, through thin cloud, but M31 was pretty, showing dark lanes at 155x, and traceable out as far as star cloud NGC 206. M32 and M110 seemed to have different textures as well as different surface brightnesses. The view of M33 through cloud at 155x was not impressive -- all I could see was its central part, but a later view, at 93x through a break, showed the stretched-out S shape of its spiral arms.

After I had looked at forty or fifty objects, I was beginning to be a little tired and thought it must be late. But no -- it was winter, and I had started observing at dusk. It was 8 PM. I took a coffee break and offered the telescope to some friends, who are experienced planetary observers, for a while. They promptly turned to Jupiter and Saturn and started playing with eyepieces. Seeing had improved a bit, and the spot formerly known as "Great Red" had come into view. They and a third observer, who had a late-model AP 155 EDFS set up ten meters away, took turns looking at the large planets. The consensus seemed to be that though the night was not first-rate, the AP-10 was showing more detail than both smaller telescopes and larger ones. (The larger ones were fast Dobson-mounted Newtonians, and I did not record whether the smaller one included the AP 155.) That is a strong positive statement. If true, it may indicate a combination of two things; first, that the telescope was of a useful size for the seeing that prevailed -- more aperture would have resulted in taking a much worse hit from poor seeing

-- and second, that the telescope itself was not doing much on its own to ruin the image, that is, that its optics were very fine. All this is as I had hoped when I ordered it.

A sucker hole crossed Auriga and Taurus, so I tried a few objects there from my serious deep-sky list. I only looked at one faint galaxy, UGC 3374, but at 93x, I could see it. I also spotted the extremely faint planetary nebula, IC 2120 -- I could only suspect it at 93x, even with an Orion UltraBlock light-pollution filter, but at about 300x, with the zoom eyepiece, I could hold it without the filter. If the telescope can pull in these demanding objects, it can probably do most deep-sky work in my current C-14 program. I don't think it is quite as good as the C-14 for deep-sky -- a factor of two in collecting area gives the larger instrument an enormous edge -- but Harvey's coatings are twenty years old, and were never as high-tech as the AP-10's, so the difference is closer than you might expect, and my current deep-sky program usually doesn't push the C-14 to its limits.

I was still using the small central baffle, but when I tried another deep-sky object in Auriga, diffuse nebula Sharpless 2-234, I found an annoying flare of light -- most likely from nearby Capella -- overlying part of the field, so I switched to the larger baffle. The baffles screw on to a threaded stud that protrudes skyward from the center of the corrector plate. Unscrewing the small one was no problem, but installing the larger one was nerve-wracking. It was reluctant to thread on cleanly, and I did not want to cross-thread it. It would have helped if there were some way to line it up squarely before engaging the threads. (Roland Christen later swapped my telescope's baffles for a new set with the threads partly drilled out, which fixed the problem.) With the larger baffle in place, the flare went away, and I could see part of Sh 2-234 with no problem. The field of view was nice and dark -- I would say the baffling was excellent.

As the earth rotated, objects I had looked at before became better placed. I returned to Orion, and had a nice view of NGC 2023 and 2024, and an unaesthetic but convincing look at the Horsehead Nebula, all at 93x with no filter. Then I turned again to the Trapezium and put in my 8 mm Brandon. Seeing varied, but after a while waiting and tweaking the focus, I did have solid views of stars E and F. That is not much to cheer about -- I have seen six Trapezium stars with my 55 mm Vixen fluorite refractor -- but any bright star with a close, faint companion is a sensitive indicator of poor seeing or scattering in the optics, for the slightest smear of the bright star will wipe out the faint one.

Feeling optimistic, I tried Sirius, but no luck. I did see the Pup in 1999, with my C-14, and in seeing that was not perfect, so it is

possible I could find it in the AP-10 on a good night.

I tried Jupiter and Saturn again, using the zoom eyepiece to pick the best magnification. They were just transiting. I ended up with about 250x on Jupiter, but the Great Pink Spot was rotating out of view, and I am not a particularly experienced Jovian observer, so I am not sure what was special and what was not about what I saw.. Then I switched to Saturn.

To my surprise, I found myself dialing the eyepiece to its shortest focal length, 8 mm, so I put in the 8 mm Brandon. At 464x, in moments of better seeing (but seeing was not perfect, even at best) the Cassini Division appeared crisply defined, changing abruptly from dark to bright at its boundaries, not the fuzzy-edged black smear of smaller apertures. The Crepe Ring was easy, like gauze. The B ring did not have constant brightness across its width. Within the A ring, the broad brightness minimum half way from its outer limit to the outer edge of the Cassini Division, was easy, and I had occasional glimpses of a narrower dark feature between that minimum and the outer edge of the A ring, closer to the outer edge. These A-ring features have had the name "Encke" applied to them, but the nomenclature of Saturn's rings is so confusing I have given up using it. I looked for but did not see "spokes" in the rings.

On the disc, the dark band in the south temperate zone appeared narrower than usual, and even at 464x it showed a pronounced brown color. I also had a sense that the visible polar area of the disc was darker than most of the rest of it, though not as dark as the band.

The view of Saturn was startlingly good considering the seeing, and also considering that I was still using the large, not quite one third diameter, secondary baffle. I have had views approximately as good in my 1987 six-inch Astro-Physics f/8 triplet refractor, and in my C-14, but only on nights of vastly better seeing, for both telescopes.

I took the telescope down at Moon rise -- thickening cloud precluded doing anything else while waiting for Luna to get high enough to be a good target. Everything came apart as easily as it had gone together, and shortly the Mak-Cassegrain was stowed in my van for the ride home.

FURTHER EXPERIENCES:

I will make the rest of this report a running log of AP-10 experiences, with emphasis on things others might want to know.

December 20-21, 2000: I observed at a close-in hilltop site above Palo Alto, all alone. Every sound nearby became a sneaking, hungry

mountain lion, and stillness meant it was poised to pounce. Yet the stars scarcely twinkled, so I hollared "Supper time!!" to any predators present, and set up. Seeing was better than during my first-light session. Near the zenith, I could see Airy discs of stars often, though the rings were a blur, never even partially defined. It was easy to see six stars in the Trapezium, even at only 155x. The image of Sirius was better than on first-light evening, but I still couldn't split it.

Better seeing made accurate focusing easier. When seeing was momentarily at its best, there was a "snap" to focus; that is, a well-defined tiny region of focuser travel in which the image was sharpest. That is a very good sign about the optics' quality.

At 309x (12 mm Brandon), Saturn showed disc detail new to me. The broad brownish belt in the south temperate zone was accompanied by a narrow equatorial one. The south half or third of the southern hemisphere was slightly darker than the rest, and more neutral in hue, not brown. The colors and subtlety of disc shading reminded me of a young Siamese cat, whose "points" have not colored fully. The Crepe Ring and Cassini Division were well defined, and the inner part of ring B had a slightly warmer color than the outer part. The broad minimum in the middle of the A ring was present, but I did not see the narrower one further out, nor any spokes.

I looked at Jupiter but have no special report. I spent a while chasing faint galaxies, near the _Millennium_Star_Atlas_ chart limit, east in azimuth from Polaris, in Cepheus and Camelopardalis. The sky suffered from light pollution, yet galactic centers are often relatively high in surface brightness, so I could add magnification to darken the background sky and increase perceived contrast. At 155x (1.64 mm exit pupil), I found all the galaxies on my list, some twenty. The AP-10 can indeed do deep-sky work that I call serious.

There was intermittent wind when I was looking at the planets, and the AP-10 was not in the lee of my car. The G11 got jiggly enough at 309x to interfere with seeing details. Yet the wind disturbed the seeing, so details went away, hence the mount was no real problem.

December 22-23, 2000: I set up beside San Luis Reservoir, on the west side of California's Great Valley. High haze and cloud crossed the sky, but seeing was good enough near the zenith that stellar images showed a solid Airy disc and a complete, but rippling, first diffraction ring. Those conditions permitted a convincing star test, made at 464x using a Vixen 8-24 mm zoom eyepiece, with the small central baffle in place, so the central obstruction diameter was only 2.3 inches. The test took place after the instrument had been set up several hours.

The first diffraction ring was a much fainter, compared to the Airy disc, than with telescopes with one-third diameter central obstructions, like most f/10 or f/11 Schmidt-Cassegrains, and like my Intes 6-inch Maksutov-Cassegrain. Furthermore, I could not even see a second diffraction ring of this fifth or so magnitude star, though perhaps I might have if the image had been completely steady. The faintness of the rings reflects the AP-10's smaller central obstruction, and also indicates that the optics are well-enough figured to exploit the advantage of the small obstruction.

I compared out-of-focus diffraction patterns far enough out of focus that what was showing was a bright central spot surrounded by three bright rings. The rings were in motion, as they had been in focus, but were complete, and as far as I could tell, considering the motion, the patterns were identical inside and outside of focus. I am sure I could do a better star test in better seeing, but what I saw in this one leaves little doubt that the optics of this particular AP-10 are excellent.

Jupiter and Saturn were well-placed. I spent a while looking at them, and showing them to the five or six other telescopists present. Jupiter showed rich belt detail, and provided an opportunity to watch an Io transit. Moon and shadow crossed the face of the gas giant, giving views much like recent Hubble shots, though with less detail. The color contrast between Io and Jupiter was striking; Io looked like a pale gold Christmas ball suspended in front of the ruddy and creamy hues of the gas giant. Even if I had not known about Io's composition, I might have used the term "sulfur-yellow" to describe the color. The contrast was particularly striking just as the moon was about to egress from transit, when it hung suspended against the limb-darkened edge of the Jovian disc. Some wonder if NASA has correctly balanced the colors in the released images -- we could verify that they had.

Saturn showed subtler color. The details were much as on December 20-21, though more steadily seen, as the seeing was much better. Several people present said that they had never had a better view of Saturn in any telescope. The view certainly surpassed any that I myself had had, and its competitors include my own 1987 6-inch Astro-Physics triplet refractor in excellent seeing, and the 36-inch doublet at Lick Observatory in seeing that was notably less perfect.

I looked at several double stars, too. Sirius was lower, where seeing was worse, though I did see the central Airy disc at times. I thought I caught a few glimpses of the Pup, using an 8 mm Brandon for 464x, but the position angle did not check with an ephemeris.

I should have looked at gamma Andromedae earlier, but did not think of it till it was well down from the zenith and affected by declining seeing. The split between gamma-one and gamma-two was of course easy. I ran the magnification up to 742x (5 mm Pentax SMC-ED orthoscopic) to get a careful look at gamma-two, but although its Airy disc was clearly elongated, seeing did not let me check for any necking down or separation of this close, unequal double. Gamma-two Andromedae has been closing lately, it might not be within range of ten inches aperture now.

The good baffling and low scattering of the AP-10 appeared to make the colors of double stars particularly pleasant. Stars like gamma Andromedae, h3945, eta Cassiopeiae, and beta Cygni provided good examples of contrasting hues. I also used the instrument for numerous deep-sky targets, but have nothing to add to the initial impression I reported, that it is no slouch for this kind of work, though not quite the equal of my Celestron 14.

How The Grinch Went Cosmic: I took the AP-10 out on Christmas eve, on the evening of Christmas day, and on the evening of the day after Christmas. Seeing was soft, so I did no more high-resolution tests. Rather, I used the telescope for deep-sky work of the kind that makes up most of my observing. The dark, well-baffled field, with crisp images from edge to edge, helped a lot with chasing and confirming faint fuzzies. A deep-sky enthusiast could spend a long time with this instrument before running out of interesting things to look at.

I could see all five galaxies in Stephen's Quintet at 155x, and could also see the four close companions of NGC 7331; namely, NGC 7335, 7336, 7337, and 7340, though the views were not quite as good as I remember from the C-14, even though the sky was dark and transparent when I turned the AP-10 on them. I cannot run a side-by-side comparison of the C-14 and the AP-10, since I only have one mount that can hold a telescope this large, so memory will have to do; however, these objects are among my favorites, and I have looked at them many times with the C-14, usually with very nearly the same exit pupil.

I also continue to be impressed with how much easier to use the AP-10 is than the C-14. The mounted weight of the AP-10 is about a third less, making the G-11 lots easier to slew and set by hand. Set up and take down are also faster, and with the AP-10 in my van, I have the front passenger seat, where the C-14 OTA rides, available for a guest.

December 27-28, 2000: Slumming. I did not take the AP-10 out, but spent a while with my other 10-inch telescope, an f/5 Dobson with Nova optics that I built for airline transport to places like Hawaii. I

tried a handful of deep-sky targets I had looked at with the AP-10, at similar magnifications (106x in the Dobson, 93x in the AP-10), and insofar as memory permits, the images in the AP-10 were a hair brighter. That is to be expected considering the Mak-Cass's high-tech coatings (the Dobson has plain aluminum on the primary but an enhanced coating on the secondary) and small central obstruction, and again confirms my impression that the AP-10 does somewhat better for its aperture than many 10-inch instruments that amateurs use.

CONCLUSIONS:

I can summarize my initial experience with the Astro-Physics 10-inch Maksutov-Cassegrain as follows:

1) The telescope is well-designed, and easy to set up and use.

2) I have seen no indication whatsoever of thermal problems, albeit none of the nights I have had the instrument out have been very challenging thermally. Nevertheless, the lack of such problems without using the muffin fans or leaving the back dewcap off, suggests that I will not have much to worry about from thermal difficulties in the future.

3) The optics are excellent, well baffled, and easy to focus.

4) The telescope delivers a whole lot of low-contrast fine planetary detail, even when seeing is so-so, and the more so when seeing is good. It regularly does better than many other telescopes of both greater and smaller sizes.

5) Between excellent baffling and high-technology coatings, the telescope offers better deep-sky performance than a typical 10-inch Newtonian or 10-inch Schmidt-Cassegrain. It is certainly capable of deep-sky work that will satisfy a certificated flaming whacko of a deep-sky weasel, such as I.

6) More detailed optical testing and performance evaluation will require a night of near-perfect seeing.

Well and good, but is it worth ten thousand dollars? There are two parts to the answer.

First, no telescope is worth ten thousand dollars if you don't have ten thousand dollars to spend on a telescope, and many do not. Persons with a lower budget limit, or whose concern is performance per dollar, should not consider this instrument.

Second, for you who do have ten thousand dollars for a telescope, the AP-10 is a viable choice. I did not order as a whim. I was ready to spend a lot on new equipment, and I considered large Dobsons, possibly with tracking, as well as diverse fancy accessories. Yet I ordered an AP-10. My use of it so far demonstrates that it delivers more resolution on low-contrast detail than any other telescope I own, and that it provides enough capability for much of the deep-sky work I do, all in a package easy to set up and convenient to use. That is a combination worth having. You should hope that Astro-Physics produces some more of these, because I doubt I am going to sell you mine.

There is one more thing. I never have gone out of my way to name my telescopes, but many of them have nevertheless told me what their names are, or ought to be, and so it is with this one. I am not absolutely sure, but I think she is "Gillian". Persons familiar with magical co-stars of Jimmy Stewart may be able to figure out why.