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BAADER APO 95/560 CAF2 TRAVEL COMPANION

A TOP-QUALITY
GRAB-AND-GO
CROSSOVER
APOCHROMAT

Baader Apo 95/560 CaF2 Travel Companion

A Top-Quality Grab-and-Go Crossover Apochromat

By André Van der Elst

The amateur astronomer has a large choice of compact refractors today. Companies like William Optics, Takahashi, Stellavue, Tele Vue, TMB, TEC and others offer short APOs in apertures ranging from 80 mm to 110 mm. Amateur astronomers often have to go on the move to find clear and dark skies and a small but excellent telescope can do wonders visually and photographically far from city lights.

The champion between compactness and diameter is surely Astro-Physics with the legendary but elusive Stowaway 90 mm, a compact oiled-triplet APO offered for a time as an $f/5$, then as an $f/7$ instrument. The shortest one (actually with aperture of 92.5 mm $f/4.9$) is only 36-cm short and weighs 3 kilograms. Very few were produced: Roland Christen found it difficult to work with the central fluoride element of the triplet. Later, he found that even producing the $f/7$ was as expensive as making the 105-mm Traveler, and the Stowaways were discontinued,



Image 1 - The Baader Travel Companion mounted on the author's Vernonscope/Unitron alt-az mount.

much to the chagrin of many amateurs. If you're very lucky, you can sometimes find one of these little gems but at an as-

tronomical price!

Ninety-five millimeters. That seems an odd diameter, but that may well be

BAADER APO 95/560 CAF2 TRAVEL COMPANION



Image 2 - The Travel Companion is shipped in a heavy-duty plastic case (Outdoor Case) made by B&W International.

the best aperture for a pocket-sized telescope for the traveling amateur astronomer. It gives enough resolving power for interesting views of the Moon and planets and enough light gathering power for deep-sky while maintaining capacity and light weight, even for airline-cabin storage. I have used, in the past, many 70-mm to 80-mm APOs, and I've always been somewhat disappointed on the Moon and planets.

A 100-mm APO is another story! It collects as much light as 125- to 150-mm catadioptrics, depending of the coatings



Image 3 - Disassembling the scope reveals a 60-mm-long tube extension.

and obstruction of these instruments. But 100-mm APOs are or long, or heavy, or both. With 95-mm aperture, the fast Baader Travel Companion nears nicely the power of a 100-mm but with the physically dimension of most 80-mm short-focus refractors.

Until now, in my opinion the only compact APO in the league of the Stow-away is the 92-mm f/5.5 Signature APO designed by the late Thomas Back (TMB Optical). But its weight is 4.3 kilograms. Now Baader Planetarium, the small but dynamic and innovative German com-

pany, offers the 95-mm Travel Companion, a short APO made 100 percent in Germany. I had an opportunity to test the prototype for several months and put it through its paces.

Travel Case

The refractor is shipped in a heavy-duty plastic case (Outdoor Case) made by B&W International (**Image 2**). These cases have pressure-compensated valves and are made for extreme conditions. They are almost indestructible and can survive temperature between





Image 4 - By unscrewing a 60-mm-long extension tube, the tube length is reduced to only 395 mm, allowing use of a binoviewer or a Herschel wedge without the need of additional transfer lenses.



Image 5 - The Steeltrack focuser is a black-anodized 50.8-mm (2.0-inch) Crayford type. The right knob has a 1:10 precision reduction gearing. The drawtube travel is 75 mm and the focuser features a scale graduated in millimeters and inches.

-40° and +80°C and are completely airtight. There is room enough for several accessories.

The Travel Companion itself is very well made and gives a feeling of solidity with its monolithic tube and a multitude of knife-edge diaphragms machined directly into the tube. It kills any erratic light without hampering the free airflow within the tube, avoiding turbulence to go into the light cone. With so many diaphragms machined inside the tube wall,

no wonder that the inside is the darkest I've ever seen. No way to get stray light or reflections: it's as dark as in a coalpit!

Design and Construction

The lens is a triplet APO with the central CaF₂ (fluorite) element in contact by means of a thin oil film with the other two glasses. This gives only two air-glass surfaces (like Zeiss, Astro-Physics and TEC). The oil is actually the same expensive and exclusive one as used by

Zeiss, matched perfectly to the fluorite index. The objective has the seven-layer Baader proprietary Phantom Group multi-coating with transmission optimized for 520 nm. All this keeps haze to an absolute minimum: the glass seems to disappear with this seemingly invisible coating!

The optical tube is 455 mm long, including the focuser (540 mm with extended dew shield). But by unscrewing a 60-mm-long extension tube (**Image 3**),





Image 6 - The Travel Companion ships with sturdy mounting rings threaded for dovetails from Astro-Physics, Vixen, Skywatcher, and the like. The rings have a flat top with other threads permitting connecting accessories.

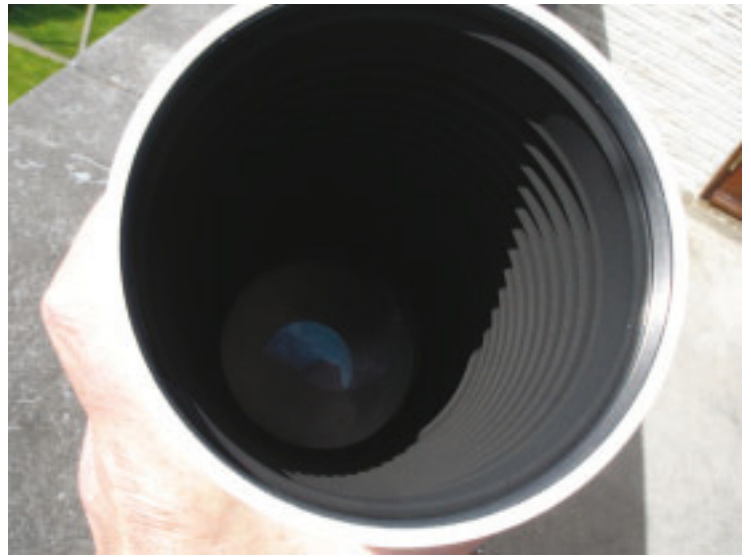


Image 7 - The baffle configuration of the optical tube are continued throughout the entire length of the dew shield.

this is reduced to only 395 mm. In this configuration, one can use a binoviewer or a Herschel wedge without the need of additional transfer lenses (Image 3). The diameter of the OTA is 99 mm (dew shield is 110 mm) and the weight only 3.1 kilograms.

The Baader-designed Steeltrack focuser is a black-anodized 50.8-mm (2.0-inch) Crayford type (Image 4). It's ready for motorized operation. The right knob has a 1:10 precision reduction gearing. The drawtube travel is 75 mm, and the focuser features a scale graduated in millimeters and inches. It too has extensive knife-edge baffling. Three clamp knobs in 120 degree distance extend pressure against a bronze compression ring on a star diagonal and other accessories. A large locking ring with three chrome grip levers permits easy rotation of the focuser.

The precision ball bearings ride on hardened and polished stainless-steel rods inset into the aluminum drawtube. This gives a buttery-smooth motion with almost no feeling of friction. If you think the celebrated Feather Touch is smooth – and it is – try this one! As a note: the

Steeltrack focuser is available for other refractors, Newtons and catadioptrics of most brands. A new short 50.8/31/75-mm Click-Lock reducing ring clamps all accessories with a gentle twist without marring them.

For mounting the OTA, Baader offers a pair of sturdy rings threaded for dovetails from Astro-Physics, Vixen, Skywatcher, and the like (Image 5). The rings have a flat top with other threads permitting connecting accessories on the Travel Companion (guide-scope, finder, etc). Mounting the scope with the provided pair of rings via an 8-inch Astro-Physics sliding bar on my Vernonscope/Unitron Alt-Az mount from my earlier Brandon 94-mm f/7 APO is straightforward. The telescope is easily balanced (it is half as long as the Brandon) and after removing the aluminum cover, the captive dew shield glides smoothly in place. The dew shield has generous length, and I never experienced fogged optics.

I compared the Travel Companion for several months with my APQ 100/640 and a 90-mm f/5 Stowaway.

Like always when I have a new telescope to test, I was clouded out for several weeks! But clouds are not a problem for daytime tests.

Daylight Observations

Nature observing shows immediately that this small scope is a very high-quality apochromat. Even a bright reflection of the sun on a window gives no trace of false color. A nearby tree (at this short distance, the air is calm) shows a wealth of small contrasty details exquisitely sharp up to 280x with an Abbe 4-mm and Zeiss 2x Barlow. There is no image breaking down at even higher magnification, just loss of light.

It surprised me that this 95-mm apo gives brighter images than the 92.5-mm Stowaway, despite the minimal difference in diameter. The difference is small but noticeable, nonetheless. That is the result of Phantom Coating, the special oil, and the fluorite element that put the light where it belongs: in the image. No internal glare or ghosts, but a clean high contrast image. The baffling (Image 6) is a far cry from the one and only baffle in

the APQ OTA! In short, the Travel Companion is a perfect spotting scope or long-distance microscope for nature study and photography when mounted on a sturdy tripod with pan-head.

When the skies eventually cleared, I checked a bright white star image inside and outside the focus. Star images are almost perfect – just a small hint of green on intra-focal and orange on extra-focal images at 140x with an Abbe 4-mm. This is very close to what my reference Zeiss APQ 100/640 shows, but the later has an $f/6.4$ focal ratio, not $f/5.9$. Vega and Venus are clean white when focused in both scopes. But there is an important difference between the APQ and the Travel Companion: While the APQ requires a prism star diagonal to obtain perfect achromatism, the Travel Companion needs a mirror star diagonal.

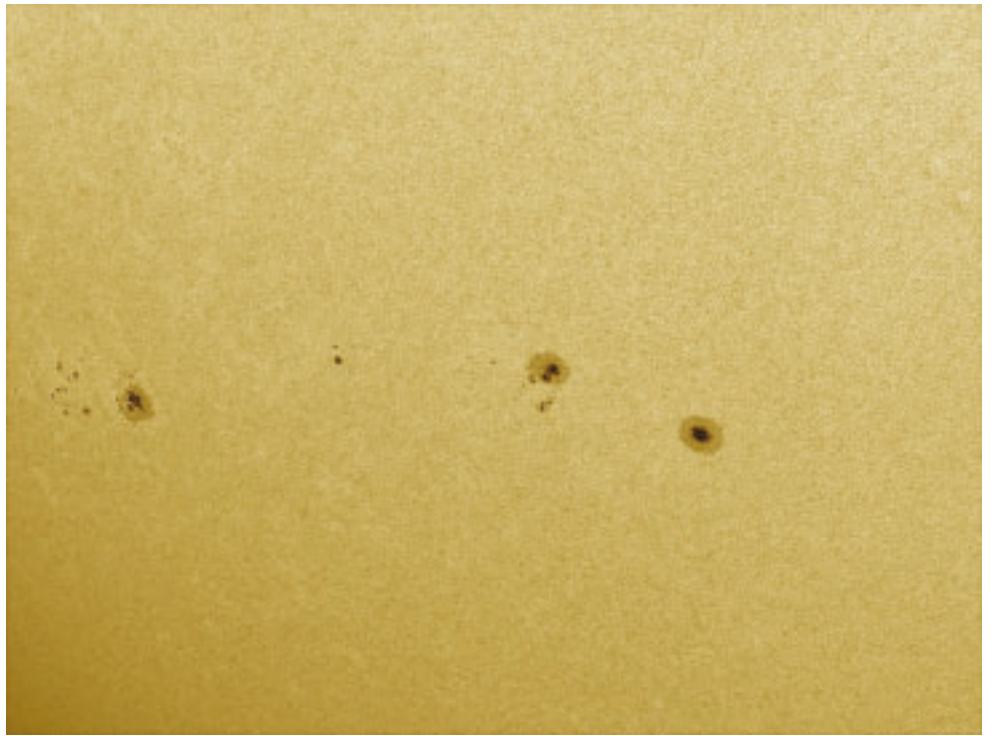


Image 8 - This image was captured through the Travel Companion using a Baader Herschel wedge.

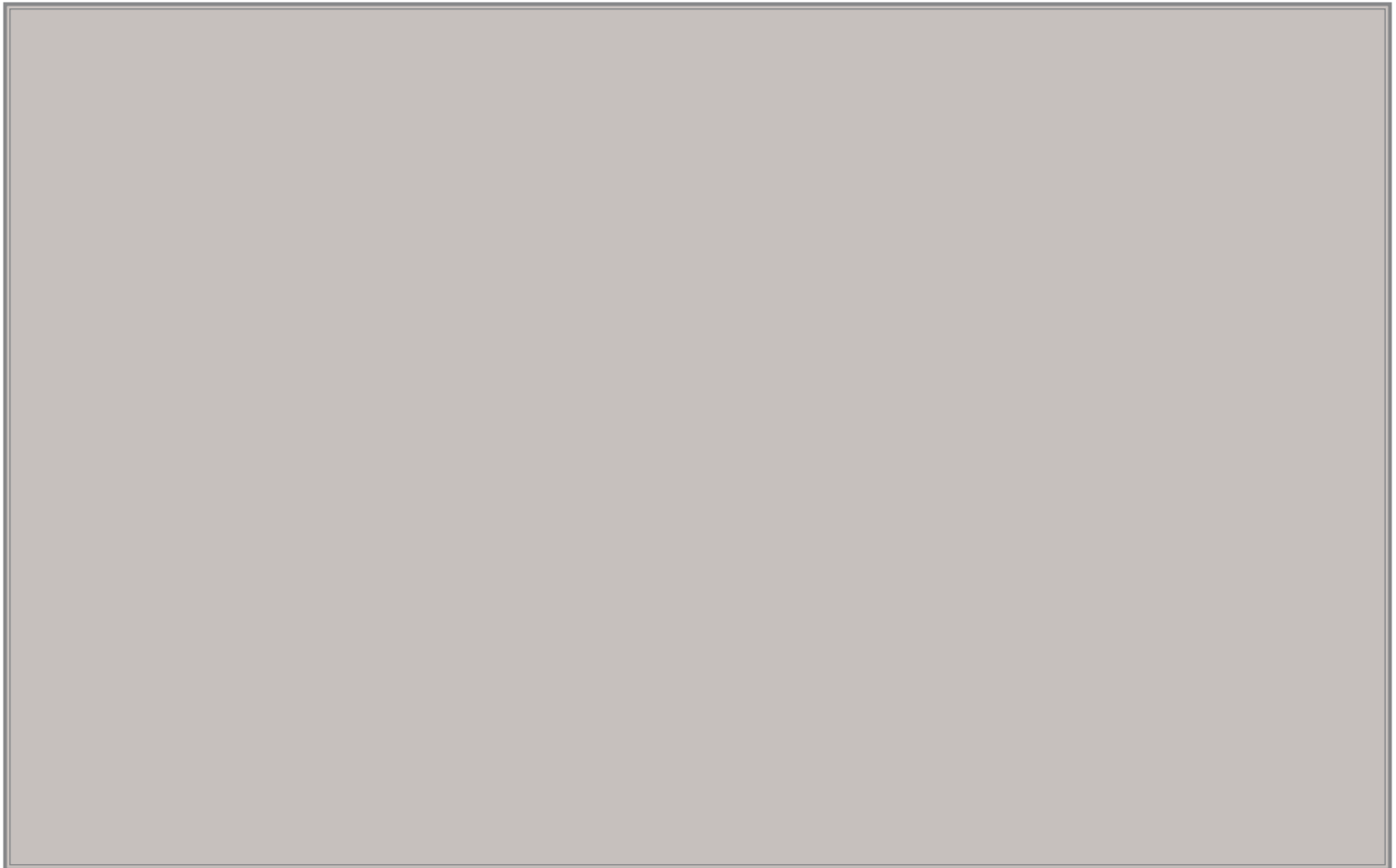




Image 9 - We don't normally associate fast apos with high-resolution planetary imaging, but the Travel Companion holds its own nonetheless.

Observing Doubles

The Travel Companion is a nice instrument for double and multiple star observers. Stars are textbook-sharp airy

discs surrounded by a very faint first ring. The Dawes' limit for this aperture is 1.2 arcseconds bringing many interesting doubles in its reach. The beautiful Double Double in Lyra is easy at 93x using an Abbe 6-mm, while the colorful Epsilon Bootes (magnitude 3 and 6.3, 2.8 arcseconds separation) splits nicely at 140x.

The next target, the binary Lambda Ophiuchi (magnitude 4.1 and 5.1) is more difficult with only 1.4 arcseconds between the components in 2012. This binary needs pushing further to 187x, 224x and 280x to be clearly split. The two white stars of Pi Aquilae (magnitude 6.3 and 6.8) have a 1.4 arcseconds separation. The pair is elongated at 70x, just split at 112x and even better

when switching to 160x. Higher magnifications up to 364x give a clean split with a dark separation between the components, confirming that the resolving power of this instrument can be easily attained.

Delta Cygni is another binary of unequal brightness (magnitude 2.9 and 6.3) and the companion lays just on the first ring at 160x. The current separation is 2.7 arcseconds. Despite my brightly illuminated Brussels sky, I could detect component E, the fifth star in the Orion Trapezium at 140x in steady seeing. No doubt that F would also be visible under darker skies. My naked eye limit is about magnitude 4.

That means deep-sky observing is poor where I live. Anyway, this short-focus APO will give impressive images and pictures of the most popular objects under dark skies, thanks to the very transparent fluorite glass, only two air-

glass surfaces, and very high-transmission coatings. Actually, when shining through the lens with a green laser, you can't see the fluorite element!

Deep-Sky Views

With only 560-mm focal length, a Panoptic 41-mm wide-field eyepiece gives 14x and an expansive rich field of almost 5 degrees, for an exit pupil of 6.9 mm. With such a wide field, a finder is not really necessary. The large fields provided by those 2-inch wide-field eyepieces in the 30- to 40-mm focal range are fantastic for large deep-sky objects like the Andromeda and M33 galaxies, the Pleiades, the Double Cluster in Perseus and other large, bright open clusters, etc. Because of the fast optics, modern highly corrected wide and ultra-wide eyepieces are best suited to get flat fields sharp to the edge. The high light transmission and contrast gives impressive images of globular clusters and planetary nebulae as well. The brightest globulars



Image 10 - The Travel Companion manages impressive image scale as evidenced by the detail in this lunar image.

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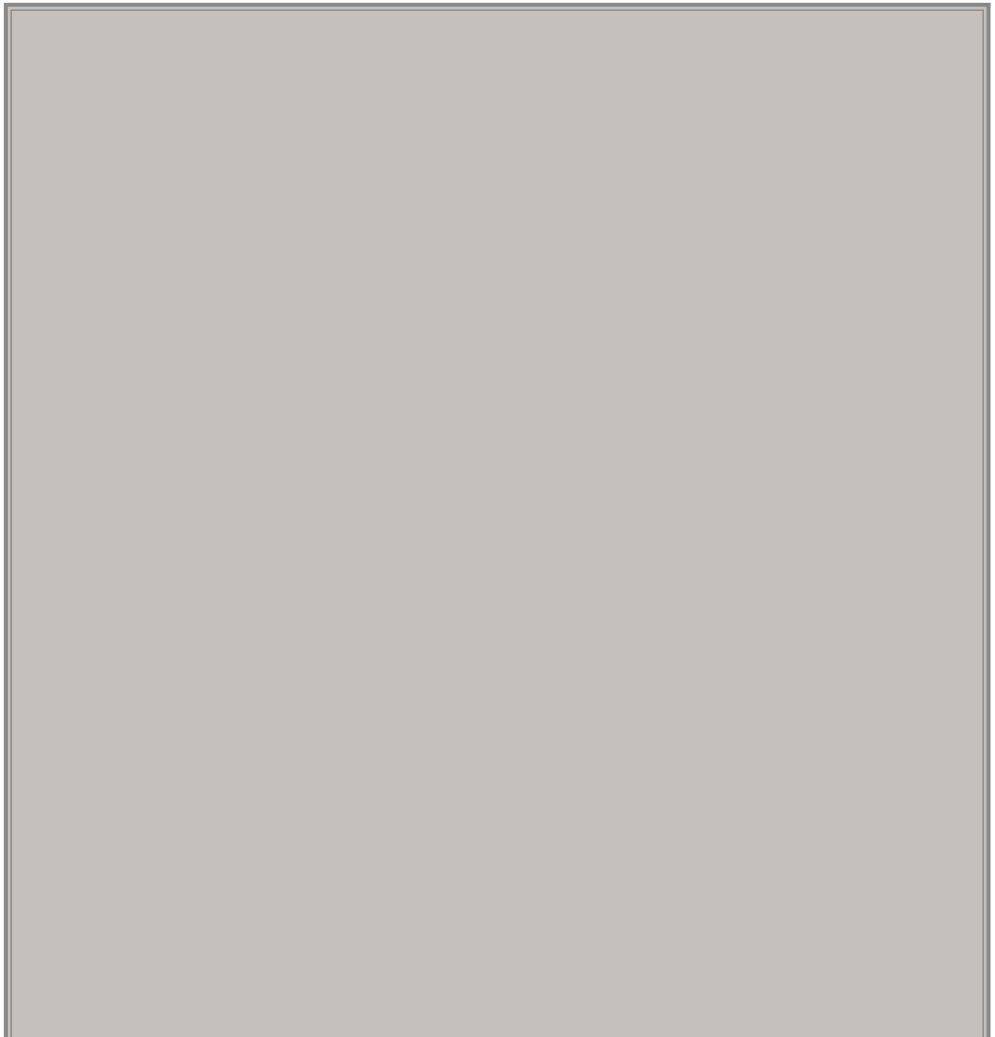




Image 11 - In this image of the stellar field surrounding M27, the Travel Companion generated nice, round stars from corner to corner.

begin to resolve even under my Brussels sky at higher magnification.

Solar System Observations

Despite its modest size, this APO shows a wealth of details on Jupiter and Saturn. The sky background is jet black right up the edge of the planetary discs. With the right planetary eyepieces there is no scatter of light. The ringed planet was unfortunately low above the horizon in 2012, but the images are sharp and contrasty at 140x, 160x (Pentax Ortho 7-mm + Zeiss Barlow) and 187x (Abbe 6-mm + Zeiss Barlow). Jupiter presents a magnificent sight. The belts are sharply delineated at 112x (Pentax XO 5-mm) and 140x, and colors, serrations, loop festoons, dark clumps, small spots are clearly visible at 160x and 187x. The Great Red Spot is easy with some detail in it. The Jovian moons are tiny disks with different color hues. The shadows during transits are coal black. All this is a far cry from what you see in many popular small catadioptrics in the 89-mm to 102-mm aperture range, whatever

their price.

Lunar details are breathtaking at high powers, again with the sky background very dark up to the edge of the lunar disc, something that will please lunar occultation observers. Magnification can be pushed up to 280x without image breakdown on this bright object. The narrow rille Rima Birt near the Straight Wall is clearly defined and irregular at 160x, ending in a small shallow dome-like feature. Many fine rilles are in the reach of this APO. Even the more difficult ones near Prinz begin to show. The Hadley rille where Apollo 15 landed is easy. The rille complex near Ramsden is also an interesting target, rimae I, III and V being easy and hints of some parts of rima II. The large formation Ptolemaeus reveals at least half a dozen shallow depressions depending on illumination and as many craterlets, A, D, M, S and C being the easiest. The difficult rille near the wall begins to show. In the landing area of Apollo 11 in Mare Tranquillitatis, a few craterlets were named after the first lunar explorers. Armstrong (4.6 kilome-

ter diameter, 670-m deep) is easy at 160x and 187x. Aldrin (3.4 kilometer) and Collins (2.4 kilometer) are at the limit of this scope but just visible by steady seeing and the right illumination. The resolving power of a 95-mm telescope on the Moon is about 2.4 kilometers.

Moon, Sun and planets are even more impressive with a binoviewer in combination with a Barlow lens or, even better, with Baader's own FFC quadruplet lens. By removing the 60-mm extension tube, focus can still be reached with the Grossfeld bino and Baader 2-inch Herschel wedge. This combination, plus a polarizing filter on each eyepiece, will provide the best views ever of sunspots, faculae and granulation!

Freezing Refractors

I was curious about the behavior of the Travel Companion under freezing conditions. Many APOs I tested in the past are better in the summer than in the winter! One could heat the lens elements, but it is better that a refractor perform at temperature extremes without need of such measures. No APQs, even the large 150-mm, ever showed image deterioration in the winter. No wonder: Zeiss tested their lenses ten years in harsh conditions (centrifugal forces in all directions, wide range of temperatures differences, even in a vacuum chamber down to 1/10 atmosphere!) to come up with a cell design and an oil that would not shrink or freeze at considerable low temperatures. Baader has tested the objective of the Travel Companion in a cold chamber down to -50°C and uses the same oil. No wonder, again, that the images remain perfect under my lighter freezing conditions!

Astrophotography

I gave the Travel Companion and the dedicated photographic 2-inch Field

Flattener for a few weeks to Bart Declercq, one of the best astrophotographers in Belgium. (See Images 8-12.) He too praises the mechanics of this very solid refractor, with really smooth and accurate focuser. The only annoyance is that when releasing the screw to allow rotation of the focuser, the image shifts several arc minutes. Tightening the screw again does re-center the image perfectly, but when framing an object, one doesn't want to have to tighten it every time to check if the position is correct. Some shift is acceptable, but it is too much.

The high-resolution Jupiter, Moon and solar images are very significantly better than with an 80-mm apo with which we compared the Travel Companion. The provided Field Flattener is perfectly tuned, and the test images show pin-point stars anywhere in the field of view of Bart's APS-C sized Canon 60D. The weather circumstances during the tests prohibited really long series of exposures, so it is hard to comment on the stability of the focus over longer periods of time. But, from the feel of the focuser and the sturdy tube, it would be very surprising if it is less than excellent with no fear of flex-issues.

Conclusion

In summary, the Travel Companion is a top-quality grab-and-go crossover apochromat, well thought out and a joy



Image 12 - Few instruments are better at producing rich fields of view than small, fast apos, as demonstrated by this image capturing M31, M32 and M110 in a single frame.

to use. It's an awesome richest-field telescope and capable of high resolution, high power views, as well. Its performance is very close to that of my Zeiss APQ 100/640, only in a much shorter and modern package with much better baffling and modern focuser. All that and for a much lower price (the APQs are no longer in production and are collector items).

However, some people thought the transport case too large and heavy when I showed the scope at club meetings. The B&W case is great and surely the most secure way to protect this fine instru-

ment, but may be overkill for many amateurs. A soft bag, like the one of the Stowaway, would increase the appeal and versatility of the Travel Companion and would have no problem qualifying as airline carry-on luggage. A padded shoulder bag and a slimmer, lighter pair of rings (or a short, fixed dovetail bar like on the APQ) would also make this compact APO an even more-perfect go-anywhere/anytime instrument. It would be more attractive to amateurs traveling light and demanding portable performance in the spirit of the original Stowaway. **AT**

