

# SPECIAL FEATURE: REBEL STEN

The next generation of Stenlight is here. We put two of them through the paces, with predictably eye-popping results.



*By Jeff Bartlett*

At the end of 2007, after the second time I made my way out of I Hate This Cave on backup light after drowning my Princeton Tec Apex, I decided I was in the market for a “professional” caving headlamp. The light output of the Apex was never an issue, but the questionable waterproofing (and tendency to occasionally shut off if the battery compartment was jostled) most certainly *was* an issue.

At the time, the rap on the Stenlight was that technology had passed it by a bit, as the unit still featured the Luxeon III LEDs even though competing LED manufacturers had been able to bring significantly improved emitters to market. When I began considering a Stenlight and comparing it to the similarly-bulletproof Scursion unit being produced overseas, I approached StenSat to inquire about what options were available.

David Niemi at StenSat suggested a somewhat experimental unit featuring the new Rebel emitters, and I jumped at the opportunity to play guinea pig. I took delivery of my light in November, 2007.

First things first: the difference between the Rebel version and the regular Stenlight is the emitters. The Rebel is Luxeon’s newest offering, one-upping the III and essentially catching up, in terms of lumen output, to the Seoul/SSC P4s and Cree XR-Es of the world, the former of which has been a popular upgrade for Stenlights in the past couple of years. In order for the Rebel emitters to work properly in the housing, StenSat has incorporated a pair of “daughter boards” to bridge the gap between the existing circuit board and the new LED. The 90-grade Rebels, those used in my prototype unit as well as in the “premium” option currently being offered, represent a 60% increase in brightness over the T-bin Luxeon III LEDs previously being used in E-series Stenlights as of 2007, already several generations

brighter than the original version of the light released in 2005 (see comments from David Niemi below for elaboration).

It’s worth mentioning that the runtime figures on Stenlight’s website are woefully out of date. In fact, according to David, with whom I corresponded frequently both before and after purchasing the light:

*The specifications on our web site are, unfortunately, a bit dated, and refer to worst-case numbers for Revision C circuit boards (the original Stenlight design from 2005). Your lamp is a Revision E board. The good news is that Rev. E boards provide a longer run time than the old specifications you saw on the Low, Medium, and High settings (about the same on Turbo).*

*Looking at the specs for your lamp, I’d estimate about 59 mA draw on Medium and 7.4 mA on Low, which would give you about 39 and 310 hours from the LG723 battery, respectively. Your lamp runs at 290 mA to the LEDs on High... [With the 2.3 AH battery] that is 8.8 hours.*

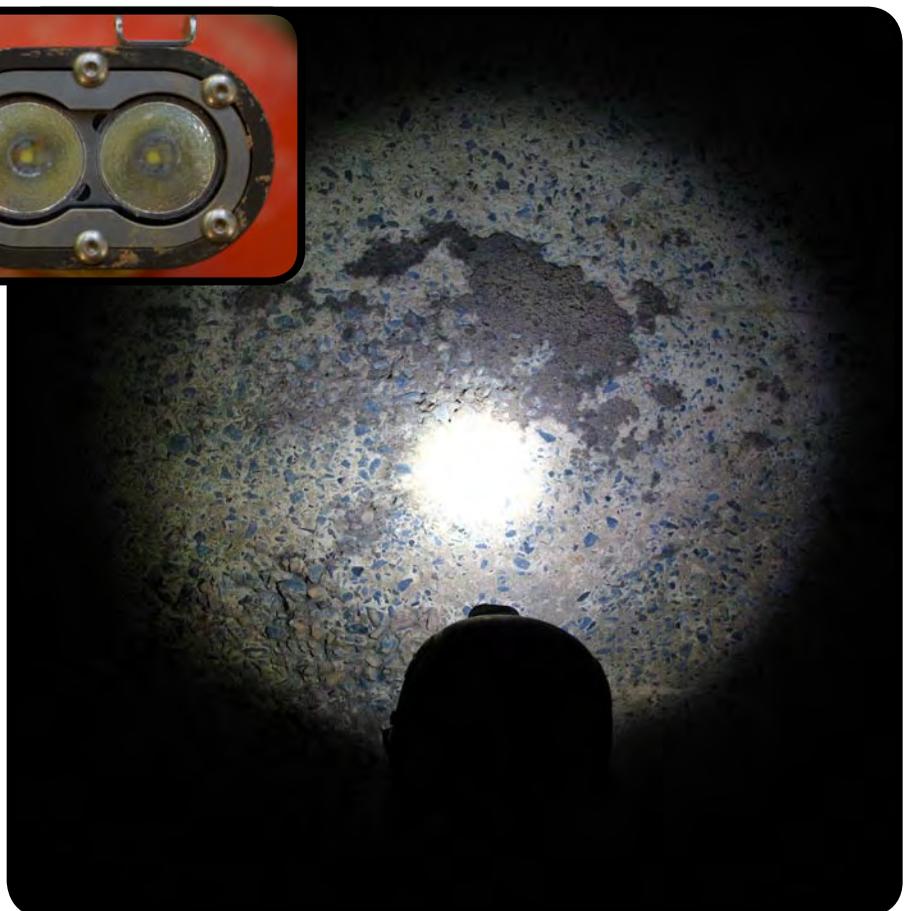
So the Rebel version runs at the same approximate current levels as the previous version. This means increased brightness at the same runtimes, a concept which is a bit misleading. In reality, most cavers won’t be blasting this thing on High or Turbo nearly as often as those with the original version; they’ll be able to use “medium” in passages that previously would have required the “high” setting, and the net effect of this improved input-to-output ratio is a longer runtime anyway.

Out of the box, I was very impressed by the build quality, even after doing tons of research and knowing what to expect. Since the only changes are to the circuitry and emitters, this is the same reaction other Stenlight users have had over the past three-plus years.

Okay, let's be honest, this headlamp is phenomenal. Shortly after purchasing it, I took it on a trip to Salts Cave in Kentucky, the main passage of which is an enormous, gloomy borehole with sooty black walls and ceiling that swallow other lights. Caving with the "high" setting (and using the "medium" setting in more reasonably-sized passages) and taking the lead, one of my fellow cavers told me he thought he'd glimpsed daylight as we exited the cave, only to realize what he saw was my light up ahead. The color temperature is pleasing, not nearly as blue as that of my Apex, although Dewayne's has a cooler hue and this has more to do with the LED manufacturer than the headlamp manufacturer.

Battery life is at least as good as advertised, and with a typical trip length of 8-12 hours, not only have I never had the battery run out, I've never even had to conserve battery power by using a lower setting; this has been the case even with trips as long as 14 hours, and on one weekend I forgot to charge the battery between cave trips and still didn't have an issue. The charger is small, and the battery charges quickly. The head unit and battery

Top: Rebel Stenlight with the stock optics, a pair of frosted collimators. Beam pattern shown with headlamp 18 inches away from target wall. Bottom: Rebel Stenlight with currently unavailable dimpled aluminum reflectors (purchased from a third party). At same distance from wall, beam spread is dramatically wider and approaches that of a carbide cap-lamp.



are both lightweight and compact. The 3M “dual lock” fastener is much more robust than industrial Velcro, but still seems prone to releasing the battery in the event it’s bumped on something, and I elected to additionally secure my battery with a pair of releasable cable ties.

While I certainly haven’t been intentionally rough on my \$300+ investment, I haven’t babied it either. I’ve gouged the housing on ceilings and bonked it on breakdown blocks. I’ve caked it with thick mud, and I’ve submerged it thoroughly (and often). So far as I can tell, I could run it over with my car and use it in-cave the next night. But you know this already.

Doing the math, I’ve used my light for a total of 53 cave trips, totalling 355 hours, and I have never even had the battery run out during a trip, not even on caving weekends with 2 or 3 trips in a row. This headlamp is nothing short of astonishing.

If I were inclined to be nitpicky and find some flaws – and I am – I will point out that the switch does require periodic cleaning, as accumulated grit & grime make switching from one setting to another more difficult. After conferring with Stensat, they recommend removing the switch assembly, cleaning thoroughly, and applying a dab or two of moly grease to keep things working smoothly. After a year of stress, things don’t move quite as positively, and I may have worn out the ball bearing (included in the available parts kit). The battery also feels a bit exposed, and as mine develops a network of scrapes and scars I worry a bit about whether the waterproof qualities will be affected, not to mention those videos I saw on Youtube showing what hap-

pens when a Lithium-Ion cell is punctured.

My Stenlight, in comparison to Dewayne’s, has a significant modification that warrants mentioning here: dimpled aluminum reflectors. These replace the standard plastic collimator optics. They were offered for

a short time by J.S. Burly, who then proceeded to disappear completely, along with his sought-after Stenlight upgrade. I was lucky enough to locate and purchase a pair from a reseller who had purchased a small stock of them to perform his own Stenlight modifications for customers. As of this writing, I do not know of a remaining source for these reflectors.

The difference in beam pattern and spread are illustrated by the photographs that accompany this article. As you can see, the reflectors create a wide, smooth circle of light with a “hot spot” in the center, very reminiscent of a carbide cap lamp, while the optics

(even wider optics such as the available 25-degree collimator, and the “frosted” light-diffusing optics in Dewayne’s unit) focus the light in a narrower fashion. The light pattern from the reflectors is very pleasing, with the broad spill being particularly well-suited for caving. This setup completely satisfies a caver’s need for both long throw and obstacle-illuminating flood.

Now that I’ve had a year to beat on mine, the Rebel-loaded Stenlights have recently replaced the Luxeon III versions. So, how can you get your hands on this next-generation caving light? In regard to the current status of the Rebel Stenlight, David Niemi sums things up in a September 16, 2008 post on Candlepower Forums:

*FYI, we have been producing Rebel-based Stenlight S7s for several months now and nearly all of*



*the new lamps for sale are now the new kind. If you want to tell them apart, the new ones have a serial number with an "F" in them.*

*The mainstream model uses mid grade Rebel LEDs, and is a little brighter than the immediately prior Luxeon III model (rev E). For that matter late rev Es were brighter than early ones. We've increased the LED brightness every 6-12 months since the S7C was introduced in 2005.*

*Around the beginning of next year we expect to have a reliable supply of top-grade Rebel LEDs, at which time we will offer a Premium model. We will also offer upgrades from all existing S7 models.*

It would appear my combination of an E-series number/board and Rebel emitters is relatively unique. The "Premium" model David references comes loaded with the 90-grade Cool White, as is the case with both my lamp and Dwayne's, and the regular production version will come loaded with a slightly less efficient 80-grade model.

*UPDATE: Indeed, caving vendors have begun stocking a "premiu" version of the Stenlight, utilizing the 90-grade Rebel featured in this article.*

The bottom line, of course, is that just like the original Stenlight, this is a caver's headlamp, wholly intended for the horrible things you're going to subject it to. The increased output from an LED upgrade reaffirms Sten's position as the lamp of choice for hard caving use, and reflects their apparent intent to continue tweaking and improving the design in order to stay there. Discussions with the manufacturer indicate that they are continuing to explore ways to improve upon their design, including ongoing tests of a waterproof battery box, a new field-replaceable cable, and the possibility that they will produce their own reflectors in the future.

Headlamp technology, especially now that rapidly-evolving LEDs are the driving force behind most innovations, can be something of an arms race; there is always something newer and brighter out there, and if not, there will be in 3 months. This design has withstood the test of time, and after a year of hard caving attached to this author's noggin, I can no longer imagine using anything else.

Top: Rebel Stenlight with reflectors, "turbo" setting. Middle: Rebel Stenlight with frosted optics, "turbo" setting.

Bottom: Princeton Tec Apex, 3-watt LED, "high" setting. All three photos taken at f/2.8 with a 1.6 second exposure and the white balance set to "daylight." Distance from headlamps to target (mannequin) was measured at 35 feet.

